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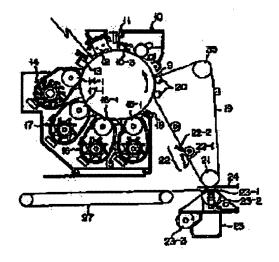
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(54) IMAGE FORMING METHOD USING INTERMEDIATE TRANSFER SYSTEM (57)Abstract:

PROBLEM TO BE SOLVED: To prevent partial transfer failure (void) which occurs during transfer and image-reproducibility failure due to toner dust by keeping amounts of devel oper electrification high in order where developing toners in separate colors are developed onto an image carrier, and setting the absolute values of the amounts of developer electrification to specific ranges.

SOLUTION: Developing units 14-17 scoop up developers together with developing sleeves 14-1-17-1 rotating in such a manner that the developers face the photoreceptor 9 in order to develop an electrostatic latent image, and each of them is composed of a developing paddle rotating for stirring, a developertoner concentration detection sensor, etc. In the image forming method using the intermediate transfer system, the amounts of developer electrification are made high in order of developing at least the black, cyan, magenta,



yellow toners onto the image carrier 9, and the absolute values of the amounts of electrification are set to $10-30\,\mu$ c/g. Thus, a satisfactory transfer characteristic can be obtained, and development having void and transfer dust can be prevented.

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<u>PRAWINGS</u>			

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CLAIMS

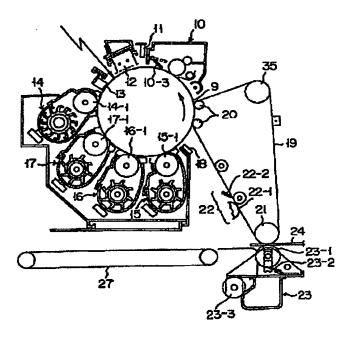
[Claim(s)]

[Claim 1] Repeat the process which imprints the toner image on an image support primarily on an endless-like middle imprint object two or more times, pile it up, and a transfer picture is formed. In the image formation method using the middle imprint method which bundles up the heavy transfer picture on this middle imprint object, and was secondarily imprinted on imprint material The image formation method characterized by holding highly the amount of electrifications of the developer which uses at least the toner which consists of black, cyanogen, a Magenta, and a yellow color for the order developed one by one on an image support, and making the absolute value of the amount of electrifications of the developer used into 10–30microc/g.

[Claim 2] The image formation method according to claim 1 which the toner used the account of before contains a hydrophobic silica at least, and is characterized by the degree of condensation being 5 - 25%.

[Claim 3] The image formation method using the middle imprint method according to claim 1 characterized by for the degrees of coloring of each toner used the account of before being 2.2-2.8, and the volume mean particle diameter of this toner being 4-9 micrometers.

Drawing selection [Representative drawing]



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DETAILED DESCRIPTION

[Detailed Description of the Invention] [0001]

[The technical field to which invention belongs] this invention makes middle imprint objects, such as a middle imprint belt, intervene, and relates to the image—formation method and the image—formation equipment which perform image formation through each imprint process of the primary imprint which imprints a toner image from an image support to a middle imprint object, and the secondary imprint which imprints the primary transfer picture on a middle imprint object to imprint material in detail about the image—formation method and the image—formation equipment which used electrophotography methods, such as a copying machine, a printer, and facsimile.

[0002]

[Description of the Prior Art] The image formation method of a middle imprint method and equipment which pile up one by one on an image support, for example, the middle imprint object which runs two or more visible color development pictures formed one by one on a photo conductor in the shape of endless, for example, a middle imprint belt, imprint the first [in all] order, and imprint the primary transfer picture on this middle imprint object secondarily collectively to imprint material are known. The middle imprint method is especially adopted as a heavy imprint method of each color toner image in the so-called full color image formation equipment reproduced using the subtractive color mixture according the manuscript picture whose color was separated to toners, such as black, cyanogen, a Magenta, and yellow. [0003] In such the image formation method and equipment, it originates in the local imprint omission at the time of the primary imprint of the toner which constitutes a color development picture, and a secondary imprint, and a toner is not locally imprinted at all in the picture on the imprint material by the transfer paper which is a final picture medium, but the so-called worm-eaten-like portion may be produced. The example of the picture of the shape of such worm-eaten is shown in drawing 1 . as a sign (w) shows in the case of an area picture, and also a worm-eaten-like picture generates a certain area by the ***** imprint omission and the bird clapper in drawing 1 -- the case of a line picture -- a line -- ****** -- it generates by producing an imprint omission like In order to abolish this unusual picture, it is making it an imprint omission not occur, and it is got blocked and technology which is expressed below is proposed as technology for it that what is necessary is just to raise imprint nature. [0004] The existing technology for raising imprint nature can be classified into the following five. (1) By using an elastomer for the technical a. middle imprint object about surface roughness reduction of a middle imprint object, and specifying the surface roughness of a middle imprint object What the adhesion of a middle imprint object and imprint material is raised, and aims at improvement and worm-eaten-like picture generating prevention for imprint nature (JP,3-242667,A), And the surface roughness of b. middle imprint object is specified, and there are some (JP,63-194272,A, JP,4-303869,A, JP,4-303872,A, JP,5-193020,A) which aim at

worm-eaten-like picture generating prevention on an imprint disposition.

[0005] The conventional technology which belongs under the category of these (1) can say that it is accompanied by electric discharge development about the toner imprint which comes out between the image support in a primary imprint process, the middle imprint object between middle imprint objects and in a secondary imprint process, and imprint material. Here, supposing a middle imprint body surface is the surface roughness of the shape of extreme irregularity, the imprint electric field over the toner on heights and a crevice will turn into heights imprint electric-field > crevice imprint electric field, and heights imprint electric field will become large relatively.

[0006] The reason can be explained as follows. Namely, when the electrode (I) which has a flat front face, and the electrode (II) which has the serrate front face which meets this electrode (I) through a minute air gap (Gp) are assumed with reference to drawing 2, The toner imprint electric field between an image support, between middle imprint objects and a middle imprint object, and the transfer media between imprint material etc. As air gap electric field between these transfer media, they are primary imprint electric field... Air gap electric—field secondary imprint electric field between an image support / middle imprint object ... The air gap electric field between a middle imprint object / imprint material can explain.

[0007] In drawing 2, when heights were set to (II-1), the crevice was set to (II-2) and imprint bias voltage is impressed to an electrode (I) and an electrode (II), as compared with the crevice (II-2) from which are separated of a distance inter-electrode [these], electric discharge concentrates on heights (II-1) with a short distance. That is, it becomes heights air gap electric-field > crevice air gap electric field. For the same reason, the air gap electric field of heights when the surface roughness of a middle imprint object is large, and a crevice turn into heights imprint electric-field > crevice imprint electric field.

[0008] Since it is such and is located in electric field with the larger toner in heights as compared with the toner in a crevice when it considers that the toner configuration of heights and crevice both is the same, it becomes that it is easy to imprint in response to the big electrostatic force. That is, as compared with heights, it can be said that a crevice is hard to imprint. Moreover, since the adhesion force to the middle imprint object of the toner located in DETCHI of a crevice etc. is larger than the adhesion force to the middle imprint object of the toner located in the edge of heights etc., it can be said that a crevice is hard to imprint. [0009] That is, a touch area becomes [the direction of the **** crevice contact shown in <u>drawing 3</u> (c) and <u>drawing 3</u> (d) compared with the **** heights contact shown in the **** flat-surface contact which showed the effective adhesion side of a toner to drawing 3 (a) supposing the field which performed / one grain of toner / hatching for the contact surface with the sign (T) in **** in <u>drawing 3</u> showed, respectively, and <u>drawing 3</u> (b), respectively] large. When a mutual material which contacts is the same system, since van der Waals' forces work to vicinal faces (= adhesion side), the size of an effective adhesion side serves as size of adhesion force, and homonymy. Therefore, it becomes crevice adhesion force > heights adhesion force. [0010] It can be said that it is good that granularity makes it a few inclination from the above thing to the level from which the difference in the imprint nature by surface irregularity does not pose a parenchyma top problem as for the relative roughness of a middle imprint body surface. Although this is also being able to say a photo conductor, it is common knowledge for the surface roughness of a photo conductor to go back to the drum using Se photo conductor in ancient times, and to suppress the surface roughness to constant value in consideration of imprint nature about this photo conductor. Therefore, it is meaningful for generating prevention of a worm-eaten-like picture to adjust the relative roughness of a middle imprint body surface to the level from which the difference in the imprint nature by irregularity does not pose a parenchyma top problem.

[0011] However, there is a limit in reduction-ization of the surface roughness of a middle imprint object, and surface irregularity is not only the irregularity of an always fixed configuration as

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shown in <u>drawing 2</u>. It is not that to which field strength only becomes settled according to the distance between crevice-heights in the case of the irregularity from which a configuration differs, either. For example, the difference in the charge degree of concentration by the difference in the size of the width of face even if heights are the same height, For example, it changes also with differences in whether it is the thing of an obtuse angle which has the top area which does not have so much whether the nose of cam of heights is the sharp thing of an acute angle which a charge tends to concentrate, and concentration of a charge, and a problem imprint object mutual [actual / each] is not so simple.

[0012] (2) The linear velocity between the technical transfer media about a setup of the linear-velocity difference between transfer media is specified, and what aims at worm-eaten-like prevention [unusual picture generating] (JP,2-213882,A) is mentioned on an imprint disposition.

[0013] About this conventional technology of (2), the primary imprint which is an imprint between a photo conductor and a middle imprint object is made into an example, and is explained. When the linear velocity of a photo conductor and a middle imprint object is equal, you have to make the electric force act so that a toner may be shifted to a middle imprint object side only in imprint electric field to the adhesion force which works between a photo conductor and a toner. (however, when establishing a linear-velocity difference between a photo conductor and a middle imprint object (i.e., when a fixed linear-velocity difference is among both), and when) The both sides of the mechanical force which originates in the speed difference of a photo conductor and a middle imprint object to a toner on the occasion of an imprint, and the electric force by imprint electric field can be made to act. Therefore, if the latter on which the both sides of the mechanical force and the force by imprint electric field can be made to act can say that it excels in imprint nature and it considers a worm-eaten-like picture to be a phenomenon by microscopic imprint nature lack It can say that it is more advantageous to the dissolution of an unusual worm-eaten-like picture to establish a linear-velocity difference between transfer media (between a photo conductor and a middle imprint object). However, in establishing a linear-velocity difference between transfer media, shearing force is given to a toner image according to the linear-velocity difference, distortion of an image is produced, and it becomes a victory.

[0014] (3) Technical imprint nip pressure about reduction of imprint nip pressure is specification-ized, and what aims at worm-eaten-like picture generating prevention (JP,1-177063,A, JP,4-284479,A) is mentioned on an imprint disposition. About such conventional technology of (3), the primary imprint which is an imprint between a photo conductor and a middle imprint object is made into an example, and is explained. It is pressed by that a photo conductor and a middle imprint object are mechanical or electrostatic force on the occasion of the primary imprint (imprint nip pressure). That is, the toner which intervenes among both will be pressed. With contiguity of the between [toner particles] distance by this press, the Juan Dell Wace force increases and the attraction between the toner particle components by condensation of a toner also increases. It can be told from a viewpoint of these reasons to imprint nature that it is desirable to make imprint nip pressure low to the dissolution of a worm-eaten-like picture.

[0015] However, both transfer media are stuck more, and if things are advantageous because of maintenance of the exact imprint physical relationship of a toner and carry out mutual distance from this viewpoint small smoothly, there is a limit in reduction—ization of imprint nip pressure. [0016] (4) Wettability of the technical a. middle imprint object material about reduction of the surface energy of a middle imprint object is specification—ized to smallness, and what aims at worm—eaten—like picture generating prevention (JP,2—198476,A, JP,2—212867,A) is mentioned on an imprint disposition. Here, wettability means the adhesion force between a liquid and a solid—state. Adhesion force is W=gammaA (1+costheta), when W shows the adhesion force which is the energy taken to pull apart the matter of a different kind, therefore sets the contact angle

when placing a liquid for the surface tension of a liquid on gammaA and a solid-state to theta, and acts between these liquids and a solid-state... (1)

It can come out and express. It can ask for the surface tension (= critical surface tension) of the material which becomes X by the following methods. That is, the reagent with which surface tension (gammaA) differs is dropped on Material X, a contact angle (costheta) is measured, and the surface tension (gammaA) of a reagent and the relation of each contact angle (costheta) are plotted the appropriate back. It asks for the surface tension (gammae) of the point that connect so-called each point of a JISUMAN plot, and the extension wire crosses the line of costheta=1 concerning this plot. This called-for surface tension is called a critical surface tension (= surface tension).

[0017] Here, since it is I reagent regularity supposing it measures wettability (W) of various material with the same arbitrary reagents, for example, water, surface tension gammaA in (1) formula becomes fixed.

RO., therefore wettability (W) and a contact angle (costheta) become proportionality. It can be said from above-mentioned I and RO that measuring wettability (W) of various material with the same reagent is asking for the contact angle (costheta) with the same surface tension (gammaA). On the other hand, in many cases, a JISUMAN plot serves as a straight line, and the inclination does not change extremely with material. As mentioned above, wettability comparison of material with the same reagent, for example, water, can say it also as surface tension comparison of material.

[0018] Although it is going to prevent generating of a worm-eaten-like picture with technology aforementioned JP,2-198476,A and given in JP,2-212867,A using a wettability small middle imprint material, in other words, this can be called what has prevented generating of a worm-eaten-like picture using a small middle imprint material of surface energy. [0019] b. A middle imprint object considers as multilayer composition, the thing (JP,62-293270,A, JP,5-204255,A, JP,5-204257,A, JP,5-303293,A) which aims at worm-eaten-like picture generating prevention on an imprint disposition, and the matter which was excellent in the mold-release characteristic at c. middle imprint body surface supply further by making material excellent in the mold-release characteristic into the maximum surface, and what aims at worm-eaten-like picture generating prevention (JP,58-187968,A) can classify into the technology of the above (4) on an imprint disposition. With the technology of the above (4), the surface tension of a middle imprint object was stopped low, the mold-release characteristic over a toner was raised, and the imprint nature to imprint material is improved. It is a well-known fact that the adhesion force between dissimilar material is expressed as a function of surface tension, and the adhesion force of a toner to a middle imprint object increases with the increase in surface tension. Here, in the case of a pure substance, surface tension is surface energy and homonymy. Moreover, as well as wettability if it generally is not a pure substance, surface tension is treated as a substitution property of surface energy. [0020] In the technology of the above (4), each adhesion force of a toner, an image support and a toner, a middle imprint object and a toner, and imprint material is force synthesizing all physical force that acts, such as an electrostatic force of each part material, and van der Waals' forces. And although reduction-izing of the surface energy in a middle imprint object is convenient in a secondary imprint so that I may be understood from the aforementioned explanation, in a primary imprint, it not necessarily always does not necessarily act

[0021] (5) the technical Nakama imprint body surface about removal of the toner filming layer of a middle imprint body surface is refreshed by filming polish etc., imprint nature is maintained, and the things (JP,5-273893,A, JP,5-307344,A, JP,5-313526,A, JP,5-323802,A, etc.) which aim at prevention of worm-eaten-like picture generating by the passage of time are mentioned [0022] among said technology of (1) - (4), temporarily, supposing the technical technical problem of (4) is attained and the surface tension of a middle imprint object is reduced as an

ideal, it will stop generating filming of a middle imprint object, and the technology of (5) will serve as needlessness That is, it can be said that the technology of (5) is complement technology compensated with the technology of (4).

[0023] On the other hand, when performing the roller transfer through a roller as a means of a secondary imprint, it is easy to generate the worm-eaten picture in a secondary imprint process. It is based on two reasons, the following a and b.

a. In the case of a full color picture, toner thickness is thick, in addition to a bird clapper, with contact pressure with a roller, the mechanical adhesion force to a middle imprint object increases by increase of the mechanical adhesion force which is a non-Coulomb force between the front face of a middle imprint object and a toner occurring powerfully, i.e., roller ** by the pressure welding of a roller, the effective density of a toner increases, and van der Waals' forces increase by toner contiguity, consequently the adhesion force between toners to a middle imprint object increases.

[0024] b. In process in which an image formation process is repeated and performed, cause the filming phenomenon of a toner in which a toner adheres to a middle imprint body surface in the shape of a film, and adhesion force occurs between a middle imprint body surface and a toner. That is, although selection use of surface tension or the small material of surface energy is generally carried out so that toner filming may not occur on a middle imprint object, (i "the adhesion force corresponding to the surface tension between a middle imprint object and a toner") will be generated in that case. And once toner filming occurs, although the adhesion force between "a middle imprint object and a toner" serves as (ii "the adhesion force determined with the surface tension of toners"), it is clear here. [of the adhesion force of (ii) being larger than the adhesion force of (i)] Since the adhesion force between toners increases, while an imprint is not partially made by the above, an omission phenomenon occurs, and it can be said that a worm—eaten picture is produced.

[0025] It is the U.S. patent as a means to avoid this inside omission phenomenon, about generating of the worm-eaten picture in a secondary imprint process. There is technology indicated by the No. 5,053,827 specification (METHOD AND APPARATUSFOR INTERMITTENT CONDITIONING OF A TRANSFER BELT).

[0026] The roller (conditioning mean) which consists of members which consist of material of the fluorine system which has surface energy smaller than the middle imprint hair side of belt side energy as a middle imprint object is applied to a middle imprint belt front face, and this U.S. patent has the indication by having the conditioning process which reduces the surface energy of a middle imprint belt front face.

[0027] Furthermore, the middle imprint belt using the polycarbonate is made into an example. The early surface energy is 37 – 38 dyn-cm, and if a conditioning process is not used, it will go up to 40 – 45 dyn-cm. If 40 dyn-cm are exceeded, in order to suppose that the fault of an imprint will occur and to avoid this fault As described above, the roller formed with the material which used the fluorine of 30 or less dyn-cm as the base is applied to a belt, the thin coat layer of fluorine material is formed in a front face, and it is said that surface energy elevation of a belt front face is suppressed. Furthermore, this U.S. patent has conversely the indication of the purport which fault generates in the imprint to a middle imprint belt from a photo conductor, when hair side of belt side energy is lowered too much.

[0028] In the image formation equipment using the middle imprint belt (19) shown in drawing 1 mentioned later, when we used the middle imprint belt made from the polycarbonate, in the secondary imprint, the worm-eaten-like picture generated them in the passage of time.
[0029] Although the fault of a secondary imprint was canceled when the experiment which carried out the optimum dose application of the zinc stearate was conducted on the middle imprint belt as lubricant, when the coating weight of a toner decreased, the picture of the letter of "a blur" occurred and the generating place was checked, having happened at the primary imprint process became clear.

[0030] By the middle imprint belt using ETFE (ethylene-tetrapod FURORO ethylene copolymer) which is the material of a fluorine system, the above-mentioned "blur" phenomenon occurred from the first stage. As opposed to middle imprint hair side of belt side energy being suppressed by a certain level according to the aforementioned conditioning process, if this is checked with the conventional example Although the photo conductor which is a toner image support is grinding the front face with the cleaning-brush roller etc. A toner adheres to a front face in the shape of a film like a middle imprint belt with time, or Ozone, NOx, etc. are polluted by the electric discharge generation gas of a corona charger, surface energy goes up gradually, and it is thought that it is because a toner becomes easy to adhere to a photo conductor side mechanically and imprint nature is spoiled.

[0031] The black toner image imprinted as the image section reproduced in black toner monochrome, such as the black character section, in the equipment which has the order of imaging which piles up an image to the middle imprint object other than the fault by which some toner images are not imprinted actualizes degradation of this imprint performance also as fault conversely imprinted at subsequent processes to a photo conductor in order of black, cyanogen, a Magenta, and yellow. Incidentally, it is thought that fault occurred from the first stage by the middle imprint belt of ETFE because the surface energy differences of a photo conductor front face and a middle imprint belt front face differed greatly in the initial state. [0032] In order to avoid such faults, when middle imprint hair side of belt side energy becomes high too much, with the technology concerning the aforementioned U.S. patent, it is carrying out to operating a conditioning process. A conditioning process is operated when the copy number of sheets decided beforehand is specifically exceeded.

[0033] However, it is clear un-arranging [which interrupts copy work and operates a conditioning process], and the middle imprint belt front face of be [it / in a fixed state / necessarily] is clear after the copy number of sheets always decided beforehand.
[0034] Moreover, if it observes about the toner used, in order to prevent a worm-eaten picture, the method of raising the fluidity of a toner and making the volatility at the time of an imprint raising, and the method of adding a resin particle etc. to a toner and preventing the consolidation of the toners by the press at the time of an imprint are learned. However, when improving the fluidity of a toner too much, there is a case where become easy to generate the phenomenon in which a toner breaks up, and faithful reappearance of a character etc. becomes impossible at the time of an imprint.

[0035]

[Problem(s) to be Solved by the Invention] Therefore, the purpose of this invention cancels the trouble in the above-mentioned conventional technology, and is in the image formation method using the middle imprint method to prevent the local poor imprint (worm-eaten) generated at the time of an imprint, and the poor repeatability of the picture by the dust of a toner. [0036]

[Means for Solving the Problem] The above-mentioned technical problem repeats the process which imprints the toner image on (1) "image support of this invention primarily on an endless-like middle imprint object two or more times, piles it up, and forms a transfer picture. In the image formation method using the middle imprint method which bundles up the heavy transfer picture on this middle imprint object, and was secondarily imprinted on imprint material At least the toner which consists of black, cyanogen, a Magenta, and a yellow color The amount of electrifications of the developer used for the order developed one by one on an image support is held highly. And the image formation method characterized by making the absolute value of the amount of electrifications of the developer used into 10–30microc/g", (2) The toner used the account of before " contains a hydrophobic silica at least. The degrees of coloring of each toner used the image formation method given [aforementioned] in (1) term characterized by the degree of condensation being 5 – 25%" and the account of before (3) " are 2.2–2.8. It is solved by and the image formation method using the middle imprint method given [

aforementioned] in (1) term characterized by the volume mean particle diameter of this toner being 4–9 micrometers." "Moreover, (4) Repeat the process which imprints the toner image on an image support primarily on an endless-like middle imprint object two or more times, pile it up, and a transfer picture is formed. In the image formation equipment using the middle imprint method which bundles up the heavy transfer picture on this middle imprint object, and was secondarily imprinted on imprint material At least the toner which consists of black, cyanogen, a Magenta, and a yellow color The amount of electrifications of the developer used for the order developed one by one on an image support is held highly. And the image formation equipment characterized by making the absolute value of the amount of electrifications of the developer. used into 10–30microc/g", (5) The toner used the account of before " contains a hydrophobic silica at least. The degrees of coloring of each toner used the image formation equipment given [aforementioned] in (4) terms characterized by the degree of condensation being 5 – 25%" and the account of before (6) " are 2.2–2.8. It is solved by and the image formation equipment using the middle imprint method given [aforementioned] in (4) terms characterized by the volume mean particle diameter of this toner being 4–9 micrometers."

[0037] Although it passes through the process imprinted at once on imprint material (secondary imprint) after the toner of a color with which this inventions differ on a middle imprint object in the target image formation method laps, on a middle imprint object, each color toner is imprinted one by one from an image support (primary imprint). In this case, the fault that the amount of electrifications becomes easy to rise, the imprint property of the toner at the time of a secondary imprint will change with order of a primary imprint in order to receive many charge histories on a middle imprint object, and the color tone of a color picture will differ from an original manuscript produces the toner imprinted primarily first. Such fault is canceled by this invention. Hereafter, this invention is explained in detail.

[0038] It became clear that the imprint property at the time of the secondary imprint of two or more colors regularity—izes by the color, and the color picture of the stable color tone is obtained by making the amount of electrifications of the developer to be used high in order of development as a result of this invention persons' examination. Moreover, the absolute value of the amount of electrifications of a developer is desirable, in order that considering as 10–30microc/g may be stabilized and it may acquire an imprint property.

[0039] Furthermore, in order to attain the purpose of this invention, it is necessary to give a suitable fluidity, and as for the degree of condensation, to the toner used for this invention, it is desirable that it is 5-25%. When the degree of condensation is less than 5%, the dust of the toner at the time of an imprint may be generated, and, in an adult case, worm-eaten may occur rather than 25% at the time of an imprint.

[0040] Measurement of the degree of condensation of a toner can be performed by the following methods. That is, using a powder circuit tester (Hosokawa Micron CORP. make), a screen (75 micrometers of openings, 45 micrometers, and 22 micrometers) is arranged in this order from a top, a 2g toner is supplied to the screen of 75 micrometers of openings, vibration is given for 30 seconds with the amplitude of 1mm, the weight of 0.5, and 0.3 and 0.1 is applied and added to each measurement, and the toner weight of each plus sieve after vibration is computed by percentage.

[0041] Moreover, it is effective in order that a hydrophobic silica may attain the purpose of this invention as an additive mixed especially to a toner. A hydrophobic silica usually shows the thing of the 50% or more of the degrees of hydrophobing here. The degree of hydrophobing of a silica impalpable powder is controllable by carrying out surface treatment (hydrophobing processing) of the front face of a silica impalpable powder with a silane system compound. That is, a silane compound is made to react to the hydroxyl group combined with the silica impalpable powder, and it can control by replacing a hydroxyl group by the siloxyl machine etc. Therefore, the degree of hydrophobing is the rate of the hydroxyl group which disappeared by the above-mentioned reaction among the hydroxyl groups which existed before hydrophobing.

Hydrophobing processing is performed by making a dialkyl dihalogen-ized silane, a trialkyl halogenation silane, hexa alkyl disilazane, an ARUKIRUTORI halogenation silane, etc. react to a silica impalpable powder under an elevated temperature.

[0042] Moreover, the degree of hydrophobing of the aforementioned silica impalpable powder can be measured by the following method. That is, 50ml of water is put into a 200ml beaker, and a 0.2 moreg silica impalpable powder is added, and ml of the dropping methanol when the silica impalpable powder which adds a methanol and is appearing from the buret with which the nose of cam was immersed underwater beginning to sink, and sinking completely at the time of dropping, agitating gently by the magentic stirrer, -- reading -- degree of hydrophobing ={-- ml of a dropping methanol -- a number -- /(ml of 50+ dropping methanol number)]x100 (%) since -- it asks The degree of hydrophobing of a silica impalpable powder is so high that the value of the degree of hydrophobing is large since the silica impalpable powder which carried out the role of a surfactant in this case, and has floated with dropping of a methanol distributes a methanol underwater through a methanol. Moreover, 0.1-2.0 weight section addition of the content of the hydrophobic silica used for this invention is carried out to the toner particle 100 weight section. Moreover, it is a 0.3 - 1.5 weight section grade especially preferably. [0043] Furthermore, it became clear to phenomena, such as worm-eaten [at the time of the above-mentioned imprint], and dust of a toner, that the direction with little coating weight per unit area of the toner developed is advantageous as a result of this invention persons' examination.

[0044] That is, although a toner is further transferred to imprint material, when there is much coating weight of a toner, condensation of toners is promoted by the consolidation of a toner by the press at the time of an imprint, and it is easy to generate dust from an image support, without [a middle imprint object and] becoming easy to generate worm-eaten and being able to perform transition of a still more faithful toner.

[0045] Moreover, although it is generally desirable for high-definition-izing to diameter[of a granule]-ize a toner, it becomes easy to generate the aforementioned worm-eaten phenomenon by diameter[of a granule]-izing. Therefore, although it is desirable to lessen development coating weight of a toner further, picture concentration runs short in this case, and a high-definition picture is no longer acquired.

[0046] Therefore, it is necessary to raise the degree of coloring of a toner. On the other hand, when there is too little coating weight of a toner, the feeling of ZARATSUKI of a picture comes to be conspicuous. As for the degree of coloring of these points to a toner, being referred to as 2.2–2.8 is desirable.

[0047] The degree of coloring of a toner was measured as follows here. That is, toner 1 mg/cm2 was made to adhere to a transfer paper (the Ricoh make, Types 6000 and 70W), the fixing equipment of the Ricoh pulley tail 550 was passed, and picture concentration was measured for the fixing picture with the 938 SUPEKUTORO densitometer made from X-Rite. Moreover, as for the volume mean particle diameter of the toner used for this invention, it is desirable to be referred to as 4-9 micrometers. While the feeling of ZARATSUKI of a picture is lost by being referred to as 9 micrometers or less, a picture with high resolution is acquired. Moreover, in the case of less than 4 micrometers, worm-eaten [at the time of an imprint] may occur. [0048] Hereafter, the toner and developer which are used for this invention are explained in detail. As a binder resin used in the toner used by this invention, all the things used as a binding resin for toners from the former are applied. Specifically Styrene, such as polystyrene, poly p-chloro styrene, and polyvinyl toluene, and the polymer; styrene-p-chloro styrene copolymer of the substitution product, A styrene-propylene copolymer, a styrene-vinyltoluene copolymer, A styrene-vinyl naphthalene copolymer, a styrene-methyl-acrylate copolymer, A styrene-ethyl-acrylate copolymer, a styrene-butyl-acrylate copolymer, A styrene-acrylic-acid octyl copolymer, a styrene-methyl-methacrylate copolymer, A styrene-ethyl-methacrylate copolymer, a styrene-methacrylic-acid butyl copolymer, A styrene-aipha-crawl

methyl-methacrylate copolymer, a styrene acrylonitrile copolymer, A styrene-vinyl methyl-ether copolymer, a styrene-vinyl ethyl ether copolymer, A styrene-vinyl methyl ketone copolymer, a styrene-butadiene copolymer, A styrene-isoprene copolymer, a styrene-acrylonitrile-indene copolymer, Styrene system copolymers, such as a styrene-maleic-acid copolymer and a styrene-maleate copolymer; A polymethylmethacrylate, Poly butyl methacrylate, a polyvinyl chloride, polyvinyl acetate, polyethylene, Polypropylene, polyester, a polyvinyl butyl butyral, a polyacrylic resin, These are independent, or rosin, denaturation rosin, a terpene resin, phenol resin, aliphatic series or an alicycle group hydrocarbon resin, an aromatic system petroleum resin, chlorinated paraffin, paraffin wax, etc. are mentioned, and they are used by two or more sorts, mixing. In these, especially desirable things are a polyol resin, polyester, and an epoxy resin in this invention.

[0049] In the toner of this invention, in order to give suitable electrification for a toner, it is desirable to make an electrification control agent contain. As an electrification control agent in this case, the matter of a white system is added from the transparent plane color which does not spoil the color tone of a color toner, and what can carry out stabilization grant of the toner electrification nature is desirable to negative polarity or straight polarity. Specifically, as a thing of straight polarity, quarternary ammonium salt, an imidazole metal complex, salts, etc. are used, and a salicylic-acid metal complex, salts, organic boron salts, a calyx allene system compound, etc. are used as a thing of negative polarity.

[0050] Moreover, the stain pigment as a coloring agent which can obtain the toner of yellow, a Magenta, cyanogen, and a black color can be used. for example, independent in any conventionally well-known stain pigments, such as stain pigments, such as carbon black, lamp black, ultramarine blue, the aniline bule, a copper phthalocyanine blue, a Phthalocyanine Green, Hansa yellow G, rhodamine 6G, a lake, a KARUKO oil blue, chrome yellow, a Quinacridone, a benzidine yellow, a rose bengal, and a triaryl methane system color, — or it can be used, mixing The amount of these coloring agents used is usually 3 – 20 % of the weight preferably one to 30% of the weight to a binding resin.

[0051] Moreover, it is possible to add hydrophobic titanium oxide, a hydrophobic alumina, etc. in order to raise the fluidity other than the hydrophobic silica shown in this invention as an external additive added to a toner. In addition, you may add fatty-acid metal salts (a zinc stearate, aluminum stearate, etc.), a polyvinylidene fluoride, etc. if needed.

[0052] Moreover, it is possible to give electrification to a toner, to mix with a carrier in order to convey a toner in a development unit, and to use it as a two component developer. That by which iron powder with a particle size of about 20–200 micrometers, nickel powder, ferrite powder, the glass bead, etc. coated the front face with the mixture of these resins, such as a styrene–acrylic–ester copolymer, a styrene–methacrylic–ester copolymer, an acrylic–ester polymer, a methacrylic–ester polymer, silicone resin, polyamide resin, an ionomer resin, and polyphenylene sulfide resin, by making these into a core material as a carrier again is used. [0053]

[Embodiments of the Invention] Hereafter, this invention shoots based on drawing 4, and the example of the image formation method and the example of equipment are further explained to a detail. In the equipment of drawing 4, the color picture data from the color scanner which is not illustrated are changed into a lightwave signal, and an electrostatic latent image is formed in a photo conductor (9) of the write-in optical unit which performs the optical writing corresponding to the manuscript picture and which is not illustrated. This optical unit is well-known in itself, and consists of a laser diode, a polygon mirror, a polygon motor, an image formation lens, a reflective mirror, etc. a photo conductor (9) — an arrow — like — a counterclockwise rotation — rotating — although — The cleaning unit which contains a front [cleaning] electric discharge machine, a KUNININGU roller, and a cleaning blade (10–3) in the surroundings of it (10), electric discharge — a lamp — (— 11 —) — electrification — a vessel — (— 12 —) — potential — a sensor — (— 13 —) — Bk — a development counter — (— 14 —) — C — a

development counter — (— 15 —) — M — a development counter — (— 16 —) — Y — a development counter — (— 17 —) — development — concentration — a pattern — a detector — (— 18 —) — middle — an imprint — a belt Each development counter (14) — (17) consists of a development paddle which rotates in order to pump up and agitate development — (17–1) and the sleeve (14–1) which are rotated so that a developer may be made to counter a photo conductor (9), in order to develop an electrostatic latent image, and a developer, a toner concentration detection sensor of a developer, etc. Here, the example which set sequence (color toner formation sequence) of development operation to Bk, C, M, and Y explains operation below (however, sequence is not restricted to this).

[0054] If copy operation understands and is carried out, the read of Bk image data will start from timing predetermined with the color scanner which is not illustrated, and the optical writing by the laser beam and latent-image formation will start based on this image data (Bk latent image is called hereafter.). Suppose that it is the same also about C, M, and Y. That development should be made possible from the point of this Bk latent image, before a latent-image point arrives at the development position of Bk development counter (14), the rotation start of the development sleeve (14-1) is carried out, and Bk latent image is developed with Bk toner (the amount of electrifications is held to the minimum). Then, although development operation of Bk latent-image field is continued, when Bk latent-image back end section passes through Bk development position, it changes into a development non-operative state. This is made to complete at least before the following C picture point reaches. [0055] Subsequently, Bk toner image formed on the photo conductor (9) is imprinted on the front face of the middle imprint belt (19) by which the uniform drive is carried out with the photo conductor (9) (the toner image imprint to a middle imprint belt (19) from a photo conductor (9) is hereafter called "primary imprint"). A primary imprint is performed by impressing imprint bias voltage in the state where the photo conductor (9) and the middle imprint belt (19) contacted. And the toner image of Bk, C, M, and Y which are formed in a middle imprint belt (19) one by one at a photo conductor (9) is aligned one by one to the same side, the primary transfer picture of 4 color piles is formed, and a package imprint (secondary imprint) is performed to a transfer paper after that. About the unit configuration of this middle imprint belt (19), and operation, it mentions later.

[0056] Although it progresses after Bk process in a photo conductor (9) side at C process which used C toner which next held the amount of electrifications small, C picture read by the color scanner begins from predetermined timing, and C latent-image formation is performed in the laser beam writing by the image data. After previous Bk latent-image back end section passed to the development position, and before the nose of cam of C latent image reaches, C development counter (15) carries out the rotation start of the development sleeve (15–1), and develops C latent image with C toner which held the amount of electrifications small to the 2nd. Although the development of C latent-image field is continued after that, when the latent-image back end section passes, it changes into a development non-actuation state like the case of previous Bk development counter. a mist [this] beam — it is made to complete before the following M latent-image point reaches About the process of M and Y, since the amount of electrifications uses the toner held greatly one by one and also operation of each image data read, latent-image formation, and development is the same as that of the process of above-mentioned Bk and C, explanation is omitted.

[0057] The middle imprint belt (19) is constructed over the imprint bias roller (20), the drive roller (21), and the follower roller (35), and drive control is carried out from the drive motor 2 which is not illustrated. A belt cleaning unit (22) is constituted by the brush roller (22-1) which the abbreviation half has exposed, rubber blade (22-2) **, etc., and carries out attachment-and-detachment operation according to the attachment-and-detachment mechanism which is not illustrated. The timing of this attachment-and-detachment operation is made to desert a middle imprint belt (19) side until the primary imprint of Y (this example four

amorous glance of the last color) is completed from a print start, is subsequent predetermined timing and cleans by making a middle imprint belt (19) side contact according to the aforementioned attachment—and—detachment mechanism.

[0058] The paper imprint unit (23) consists of attachment-and-detachment mechanisms (23-3) from a paper imprint bias roller (23-1) (electric-field means forming for a secondary imprint), a roller cleaning blade (23-2), and a middle imprint belt (19) etc. Although this bias roller (23-1) has usually deserted the middle imprint belt (19), when carrying out the package imprint of the heavy picture of four colors formed in the middle imprint belt (19) side at a transfer paper (imprint material) (24), it takes timing, is pressed by the attachment-and-detachment mechanism (23-3), it impresses predetermined bias voltage to the aforementioned roller (23-1), and performs the imprint to a transfer paper (24). Thus, the transfer paper (24) by which the package imprint of the 4 color pile pictures was carried out from the middle imprint belt (19) side It is conveyed in a paper conveyance unit (27) by the fixing assembly which is not illustrated, and the full color copy by which weld fixing was carried out in the toner image with the fixing roller controlled by predetermined temperature and the pressurization roller is obtained. On the other hand, the front face of the photo conductor after a belt imprint (9) is cleaned in a cleaning unit (10), and is further discharged uniformly with an electric discharge lamp (11). Moreover, as mentioned above, to the predetermined timing after the belt imprint end of Y picture of the last color, according to the aforementioned attachment-and-detachment mechanism, cleaning of a middle imprint belt (19) presses a cleaning unit (22) to a middle imprint belt (19) side, and performs it.

[0059]

[Example] Hereafter, an example explains this invention to a detail further.

Example 1 <a black toner> Binding resin (polyol resin : softening temperature of 105 degrees C) The 100 weight sections Electrification control agent (fluorine-containing quarternary-ammonium-salt compound) The 0.8 weight sections Coloring agent (carbon black) After mixing enough with a blender, melting kneading of the 7 weight sections was carried out with 2 rolls which heated at 100-110 degrees C. Coarse grinding of the kneading object was carried out by the cutter mill after natural radiationnal cooling, the pulverizer using the jet stream removed fines after trituration using pneumatic elutriation equipment, and the parent coloring particle was obtained. Furthermore, to this parent coloring particle 100 weight section, the hydrophobic titanium oxide 0.8 weight section of the 60% of the degrees of hydrophobing was mixed in the Henschel mixer, and the toner was obtained. Moreover, it mixed with the turbular mixer at a rate of 5 weight sections to the carrier 100 weight section which carried out the surface coat of the silicone resin to the ferrite particle of 50 micrometers of mean particle diameters, and this toner was made into the developer. In addition, the volume mean particle diameter of the obtained toner was [2.0 and the degree of condensation of 9.2 micrometers and the degree of coloring] 26, and the amount of electrifications of a developer was -16microc/g. Moreover, about cyanogen, the Magenta, and the yellow toner, the toner was created on the same conditions as a black toner in the following composition conditions, and the developer was acted similarly.

[0060]

[Table 1]

	シアントナー	マゼンタトナー	イエロートナー
結着樹脂	ポリオール樹脂:軟化	点105℃ 100重	量部
帯電制御角	含フッ素四級アンモニ	ウム塩化合物	
	(0.9重量部)	(1.0重量部)	(1.2重量部)
着色剤	銅フタロシアニン	キナクリドン系顔料	ジスアゾ系顔料
	ブルー顔料		
ŀ	(C.I.Pigment Blue 15)	(C.I.Pigment Red 122)	(C.I.Pigment Yellow 17)
	(2.0重量部)	(4.0重量部)	(4.5重量部)
外添加剤	疎水性酸化チタン(疎)	k化度60%)	
	(0.8重量部)	(0.8重量部)	(0.8重量部)

The property of the obtained toner and a developer is shown in Table 7. Moreover, the good result was obtained, when set to the Ricoh pulley tail 550 the toner and developer which were obtained, negatives were developed in order of black, cyanogen, a Magenta, and yellow, imprint nature (toner dust and worm-eaten) in the character section at the time of 4 color piles was evaluated and evaluation of the ZARATSUKI nature of the solid section and picture concentration was performed further. In addition, the method of evaluation was enforced as follows.

[0061] Worm-eaten rank rank 5 at the time of an imprint It is completely the non-generated rank 4. Rank 3 which worm-eaten [1-2] can check with a magnifier although it cannot check visually Rank 2 which worm-eaten [several] can check with a magnifier although it can hardly check visually Rank 1 which can check worm-eaten visually That most characters have fallen out is [0062] which can be checked visually. Rank rank 5 of the imprint dust at the time of an imprint It is completely the non-generated rank 4. Rank 3 which can check few dust with a magnifier although it cannot check visually Rank 2 which several dust can check with a magnifier although it can hardly check visually Rank 1 which dust can check visually BOYAKE of the character by dust can check visually (one 10 times the scale factor [Magnifier :] of this). [0063] ZARATSUKI nature rank rank 5 Uniform solid picture rank 4 Rank 3 which the nonuniformity of a picture can check slightly with a magnifier visually although it is uniform Rank 2 which can be checked with a magnifier although ZARATSUKI can hardly be checked visually Rank 1 which can check ZARATSUKI of a picture visually Monochromatic concentration is measured with the level picture concentration Macbeth reflection density meter (made in Macbeth) which ZARATSUKI of a picture is severe and cannot say as a solid picture.

[0064] Example 2 [0065]

[Table 2]

ブラックトナー	シアントナー	マゼンタトナー	イエロートナー
ポリエステル樹脂	:軟化点110℃	100重量部	3
サリチル酸誘導体	亜鉛塩		,
(1.0重量部)	(1.0重量部)	(1.0重量部)	(1.0重量部)
カーボンブラック	銅フタロシアニン	キナクリドン系顔料	アゾ系顔料
	ブルー		
	(C.I.Pigment	(C.I.Pigment	(C.I.Pigment
	Blue 15)	Red 122)	Yellow 180)
(7.2重量部)	(2.0重量部)	(3.8重量部)	(4.5重量部)
球水性シリカ(疎	水化度70%)		
(0.7重量部)	(0.7重量部)	(0.7重量部)	(0.7重量部)
	ポリエステル樹脂 サリチル酸誘導体 (1.0重量部) カーボンブラック (7.2重量部) 疎水性シリカ(疎	サリチル酸誘導体亜鉛塩 (1.0重量部) (1.0重量部) カーボンブラック 卸フタロシアニン ブルー (C.I.Pigment	ポリエステル樹脂:軟化点110℃ 100重量部 サリチル酸誘導体亜鉛塩 (1.0重量部) (1.0重量部) (1.0重量部) カーボンブラック飼フタロシアニンキナクリドン系類料 ブルー (C.I.Pigment (C.I.Pigment Blue 15) Red 122) (7.2重量部) (2.0重量部) (3.8重量部) 疎水性シリカ(疎水化度70%)

The toner was created on the same conditions as ** and an example 1, specified quantity mixture was carried out with the same carrier, and it considered as the developer. The same evaluation as an example 1 was performed using the toner and developer which were obtained. In addition, the property of the obtained toner and a developer and also the evaluation result of quality-of-image quality are indicated to Table 7.

[0066] Example 3 [0067]

[Table 3]

LIGOTO				
	ブラックトナー	シアントナー	マゼンタトナー	イエロートナー
結着樹脂	ポリオール樹脂:	軟化点110℃	100重量部	
帯電制御剤	含フッ素四級アン	モニウム塩化合物	サリチル酸詞	導体亜鉛塩
	(1.0重量部)	(1.0重量部)	(1.0重量部)	(1.2重量部)
着色剤	カーボンブラック	銅フタロシアニン	キナクリドン系顔料	アゾ系顔料
		プルー		
		(C.I.Pigment	(C.I.Pigment	(C.I.Pigment
		Blue 15)	Red 122)	Yellow 180)
	(9.0重量部)	(3.5重量部)	(6.0重量部)	(6.0重量部)
外添加剤	疎水性シリカ(疎	水化度80%)		
	(0.5重量部)	(0.6重量部)	(0.7重量部)	(0.7重量部)

The toner was created on the same conditions as ** and an example 1, specified quantity mixture was carried out with the same carrier, and it considered as the developer. The same evaluation as an example 1 was performed using the toner and developer which were obtained. In addition, the property of the obtained toner and a developer and also the evaluation result of quality—of—image quality are indicated to Table 7.

[0068] Example 4 [0069]

[Table 4]

	ブラックトナー	シアントナー	マゼンタトナー	イエロートナー
結着樹脂	ポリエステル樹脂	: 軟化点98℃	100重量	部
帯電制御剤	含フッ素四級アン	モニウム塩/サリ	チル酸誘導体亜鉛塩	
	(1.0/0.5重量部)	(0.8/0.7重量部)	(0.6/0.8重量部)	(0.4/0.9重量部)
着色剤	カーボンブラック	飼フタロシアニン	キナクリドン系顔料	アゾ系顔料
		ブルー		
		(C.I.Pigment	(C.I.Pigment	(C.I.Pigment
		Blue 15)	Red 122)	Yellow 180)
	(9.0重量部)	(3.5 <u>重量</u> 部)	(6.0重量部)	(5.8重量部)
外添加剤	疎水性シリカ(疎	水化度80%)		
	(0.6重量部)	(0.6重量部)	(0.7重量部)	(0.7重量部)

The toner was created on the same conditions as ** and an example 1, specified quantity mixture was carried out with the same carrier, and it considered as the developer. The same evaluation as an example 1 was performed using the toner and developer which were obtained. In addition, the property of the obtained toner and a developer and also the evaluation result of quality-of-image quality are indicated to Table 7.

[0070] The example 1 of comparison [0071]

[T	abl	le	5

			·
ブラックトナー	シアントナー	マゼンタトナー	イエロートナー
ポリオール樹脂:	軟化点105℃	100重量部	
含フッ素四級アン	モニウム塩化合物	1	
(1.2重量部)	(0.8重量部)	(0.8重量部)	(0.8重量部)
カーボンブラック	飼フタロシアニン	キナクリドン系顔料	アゾ系顔料
	ブルー		
	(C.I.Pigment	(C.I.Pigment	(C.I.Pigment
	Blue 15)	Red 122)	Yellow 180)
(9.0重量部)	(3.5重量部)	(6.0重量部)	(6.2重量部)
球水性酸化チタン	(疎水化度20%)	-
(0.7重量部)	(0.7重量部)	(0.7重量部)	(0.7重量部)
	ブラックトナー ポリオール樹脂: 含フッ素四級アン (1.2重量部) カーボンブラック (9.0重量部) 疎水性酸化チタン	ブラックトナー シアントナー ポリオール樹脂:軟化点105℃ 含フッ素四級アンモニウム塩化合物 (1.2重量部) (0.8重量部) カーボンブラック 飼フタロシアニン ブルー (C.I.Pigment Blue 15) (9.0重量部) (3.5重量部) 疎水性酸化チタン (疎水化度20%	ブラックトナー シアントナー マゼンタトナー ポリオール樹脂:軟化点105℃ 100重量部 含フッ素四級アンモニウム塩化合物 (1.2重量部) (0.8重量部) (0.8重量部) カーボンブラック飼フタロシアニンキナクリドン系顔料 ブルー (C.I.Pigment Blue 15) Red 122) (9.0重量部) (3.5重量部) (6.0重量部) 疎水性酸化チタン(疎水化度20%)

The toner was created on the same conditions as ** and an example 1, specified quantity mixture was carried out with the same carrier, and it considered as the developer. The same evaluation as an example 1 was performed using the toner and developer which were obtained. In addition, the property of the obtained toner and a developer and also the evaluation result of quality-of-image quality are indicated to Table 7.

[0072] The example 2 of comparison [0073]

[Table 6]

	_			
	ブラックトナー	シアントナー	マゼンタトナー	イエロートナー
結着樹脂	ポリエステル樹脂	:軟化点105℃	100重量部	3
帯電制御剤	含フッ素四級アン	モニウム塩化合物)	
	(1.0重量部)	(1.0重量部)	(1.0重量部)	(1.0重量部)
着色剤	カーボンブラック	銅フタロシアニン	キナクリドン系顔料	アゾ系顔料
		ブルー		
		(C.I.Pigment	(C.I.Pigment	(C.I.Pigment
		Blue 15)	Red 122)	Yellow 180)
	(12重量部)	(5.0重量部)	(9.0重量部)	(9.0重量部)
外添加剤	疎水性シリカ(疎	水化度30%)		
	(0.8重量部)	(0.8重量部)	(0.8重量部)	(0.8重量部)

The toner was created on the same conditions as ** and an example 1, specified quantity mixture was carried out with the same carrier, and it considered as the developer. The same evaluation as an example 1 was performed using the toner and developer which were obtained. In addition, the property of the obtained toner and a developer and also the evaluation result of quality-of-image quality are indicated to Table 7.

[0074]

[Table 7]

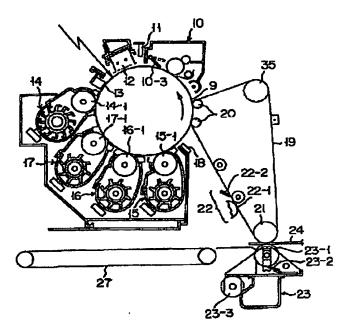
精神維持 特別					カラート	カラートナーの構成・特性	·你住				五	2000年		而像品類別編就與	助		
10 一次の量 10 10 10 10 10 10 10 1		サイサー	新華報	新香香香		本教旨 整		本筆工 3				中部年	医牙科(46	(1) (H)			44
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[0075]

[Effect of the Invention] As explained in detail and concretely, as mentioned above, this invention In the image formation method using the middle imprint method at least Black, The amount of electrifications of a developer makes high the toner which consists of cyanogen, a Magenta, and a yellow color at the order developed on an image support. And it is a good imprint property's being acquired, being able to prevent worm-eaten and development called imprint dust by making the absolute value of the amount of electrifications into 10-30microc/g, and a toner's containing a hydrophobic silica at least further, and making the degree of condensation into 5 - 25%. Furthermore, the extremely excellent effect that a good imprint property is acquired and also a still better imprint property is acquired by setting the degree of coloring of a toner to 2.2-2.8, and setting a volume mean particle diameter to 4-9 micrometers is

demonstrated.
[Translation done.]

Drawing selection [Repres ntative drawing]



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CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS EXAMPLE DESCRIPTION OF DRAWINGS DRAWINGS

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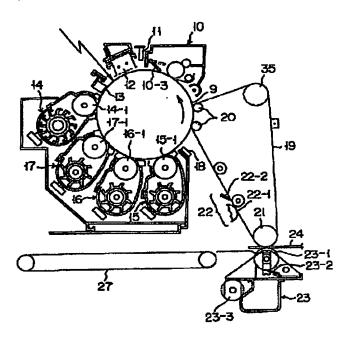
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TECHNICAL FIELD

[The technical field to which invention belongs] this invention makes middle imprint objects, such as a middle imprint belt, intervene, and relates to the image—formation method and the image—formation equipment which perform image formation through each imprint process of the primary imprint which imprints a toner image from an image support to a middle imprint object, and the secondary imprint which imprints the primary transfer picture on a middle imprint object to imprint material in detail about the image—formation method and the image—formation equipment which used electrophotography methods, such as a copying machine, a printer, and facsimile.

Drawing selection [Representative drawing]



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PRIOR ART

[Description of the Prior Art] The image formation method of a middle imprint method and equipment which pile up one by one on an image support, for example, the middle imprint object which runs two or more visible color development pictures formed one by one on a photo conductor in the shape of endless, for example, a middle imprint belt, imprint the first [in all] order, and imprint the primary transfer picture on this middle imprint object secondarily collectively to imprint material are known. The middle imprint method is especially adopted as a heavy imprint method of each color toner image in the so-called full color image formation equipment reproduced using the subtractive color mixture according the manuscript picture whose color was separated to toners, such as black, cyanogen, a Magenta, and yellow. [0003] In such the image formation method and equipment, it originates in the local imprint omission at the time of the primary imprint of the toner which constitutes a color development picture, and a secondary imprint, and a toner is not locally imprinted at all in the picture on the imprint material by the transfer paper which is a final picture medium, but the so-called worm-eaten-like portion may be produced. The example of the picture of the shape of such worm-eaten is shown in drawing 1 . as a sign (w) shows in the case of an area picture, and also a worm-eaten-like picture generates a certain area by the ***** imprint omission and the bird clapper in drawing 1 -- the case of a line picture -- a line -- ****** -- it generates by producing an imprint omission like In order to abolish this unusual picture, it is making it an imprint omission not occur, and it is got blocked and technology which is expressed below is proposed as technology for it that what is necessary is just to raise imprint nature. [0004] The existing technology for raising imprint nature can be classified into the following five. (1) By using an elastomer for the technical a. middle imprint object about surface roughness reduction of a middle imprint object, and specifying the surface roughness of a middle imprint object What the adhesion of a middle imprint object and imprint material is raised, and aims at improvement and worm-eaten-like picture generating prevention for imprint nature (JP,3-242667,A), And the surface roughness of b. middle imprint object is specified, and there are some (JP,63-194272,A, JP,4-303869,A, JP,4-303872,A, JP,5-193020,A) which aim at worm-eaten-like picture generating prevention on an imprint disposition. [0005] The conventional technology which belongs under the category of these (1) can say that it is accompanied by electric discharge development about the toner imprint which comes out between the image support in a primary imprint process, the middle imprint object between middle imprint objects and in a secondary imprint process, and imprint material. Here, supposing a middle imprint body surface is the surface roughness of the shape of extreme irregularity, the

[0006] The reason can be explained as follows. Namely, when the electrode (I) which has a flat front face, and the electrode (II) which has the serrate front face which meets this electrode (I)

electric-field > crevice imprint electric field, and heights imprint electric field will become large

imprint electric field over the toner on heights and a crevice will turn into heights imprint

relatively.

through a minute air gap (Gp) are assumed with reference to <u>drawing 2</u>, The toner imprint electric field between an image support, between middle imprint objects and a middle imprint object, and the transfer media between imprint material etc. As air gap electric field between these transfer media, they are primary imprint electric field... Air gap electric—field secondary imprint electric field between an image support / middle imprint object ... The air gap electric field between a middle imprint object / imprint material can explain.

[0007] In drawing 2, when heights were set to (II-1), the crevice was set to (II-2) and imprint bias voltage is impressed to an electrode (I) and an electrode (II), as compared with the crevice (II-2) from which are separated of a distance inter-electrode [these], electric discharge concentrates on heights (II-1) with a short distance. That is, it becomes heights air gap electric-field > crevice air gap electric field. For the same reason, the air gap electric field of heights when the surface roughness of a middle imprint object is large, and a crevice turn into heights imprint electric-field > crevice imprint electric field.

[0008] Since it is such and is located in electric field with the larger toner in heights as compared with the toner in a crevice when it considers that the toner configuration of heights and crevice both is the same, it becomes that it is easy to imprint in response to the big electrostatic force. That is, as compared with heights, it can be said that a crevice is hard to imprint. Moreover, since the adhesion force to the middle imprint object of the toner located in DETCHI of a crevice etc. is larger than the adhesion force to the middle imprint object of the toner located in the edge of heights etc., it can be said that a crevice is hard to imprint. [0009] That is, a touch area becomes [the direction of the **** crevice contact shown in drawing 3 (c) and drawing 3 (d) compared with the **** heights contact shown in the **** flat-surface contact which showed the effective adhesion side of a toner to drawing 3 (a) supposing the field which performed \prime one grain of toner \prime hatching for the contact surface with the sign (T) in **** in <u>drawing 3</u> showed, respectively, and <u>drawing 3</u> (b), respectively] large. When a mutual material which contacts is the same system, since van der Waals' forces work to vicinal faces (= adhesion side), the size of an effective adhesion side serves as size of adhesion force, and homonymy. Therefore, it becomes crevice adhesion force > heights adhesion force. [0010] It can be said that it is good that granularity makes it a few inclination from the above thing to the level from which the difference in the imprint nature by surface irregularity does not pose a parenchyma top problem as for the relative roughness of a middle imprint body surface. Although this is also being able to say a photo conductor, it is common knowledge for the surface roughness of a photo conductor to go back to the drum using Se photo conductor in ancient times, and to suppress the surface roughness to constant value in consideration of imprint nature about this photo conductor. Therefore, it is meaningful for generating prevention of a worm-eaten-like picture to adjust the relative roughness of a middle imprint body surface to the level from which the difference in the imprint nature by irregularity does not pose a parenchyma top problem.

[0011] However, there is a limit in reduction-ization of the surface roughness of a middle imprint object, and surface irregularity is not only the irregularity of an always fixed configuration as shown in <u>drawing 2</u>. It is not that to which field strength only becomes settled according to the distance between crevice-heights in the case of the irregularity from which a configuration differs, either. For example, the difference in the charge degree of concentration by the difference in the size of the width of face even if heights are the same height, For example, it changes also with differences in whether it is the thing of an obtuse angle which has the top area which does not have so much whether the nose of cam of heights is the sharp thing of an acute angle which a charge tends to concentrate, and concentration of a charge, and a problem imprint object mutual [actual / each] is not so simple.

[0012] (2) The linear velocity between the technical transfer media about a setup of the linear-velocity difference between transfer media is specified, and what aims at worm-eaten-like prevention [unusual picture generating] (JP,2-213882,A) is mentioned on an

2/6 2003/11/26 16:09

imprint disposition.

[0013] About this conventional technology of (2), the primary imprint which is an imprint between a photo conductor and a middle imprint object is made into an example, and is explained. When the linear velocity of a photo conductor and a middle imprint object is equal, you have to make the electric force act so that a toner may be shifted to a middle imprint object side only in imprint electric field to the adhesion force which works between a photo conductor and a toner. (however, when establishing a linear-velocity difference between a photo conductor and a middle imprint object (i.e., when a fixed linear-velocity difference is among both), and when) The both sides of the mechanical force which originates in the speed difference of a photo conductor and a middle imprint object to a toner on the occasion of an imprint, and the electric force by imprint electric field can be made to act. Therefore, if the latter on which the both sides of the mechanical force and the force by imprint electric field can be made to act can say that it excels in imprint nature and it considers a worm-eaten-like picture to be a phenomenon by microscopic imprint nature lack it can say that it is more advantageous to the dissolution of an unusual worm-eaten-like picture to establish a linear-velocity difference between transfer media (between a photo conductor and a middle imprint object). However, in establishing a linear-velocity difference between transfer media, shearing force is given to a toner image according to the linear-velocity difference, distortion of an image is produced, and it becomes a victory.

[0014] (3) Technical imprint nip pressure about reduction of imprint nip pressure is specification—ized, and what aims at worm—eaten—like picture generating prevention (JP,1–177063,A, JP,4–284479,A) is mentioned on an imprint disposition. About such conventional technology of (3), the primary imprint which is an imprint between a photo conductor and a middle imprint object is made into an example, and is explained. It is pressed by that a photo conductor and a middle imprint object are mechanical or electrostatic force on the occasion of the primary imprint (imprint nip pressure). That is, the toner which intervenes among both will be pressed. With contiguity of the between [toner particles] distance by this press, the Juan Dell Wace force increases and the attraction between the toner particle components by condensation of a toner also increases. It can be told from a viewpoint of these reasons to imprint nature that it is desirable to make imprint nip pressure low to the dissolution of a worm—eaten—like picture.

[0015] However, both transfer media are stuck more, and if things are advantageous because of maintenance of the exact imprint physical relationship of a toner and carry out mutual distance from this viewpoint small smoothly, there is a limit in reduction—ization of imprint nip pressure. [0016] (4) Wettability of the technical a. middle imprint object material about reduction of the surface energy of a middle imprint object is specification—ized to smallness, and what aims at worm—eaten—like picture generating prevention (JP,2—198476,A, JP,2—212867,A) is mentioned on an imprint disposition. Here, wettability means the adhesion force between a liquid and a solid—state. Adhesion force is W=gammaA (1+costheta), when W shows the adhesion force which is the energy taken to pull apart the matter of a different kind, therefore sets the contact angle when placing a liquid for the surface tension of a liquid on gammaA and a solid—state to theta, and acts between these liquids and a solid—state... (1)

It can come out and express. It can ask for the surface tension (= critical surface tension) of the material which becomes X by the following methods. That is, the reagent with which surface tension (gammaA) differs is dropped on Material X, a contact angle (costheta) is measured, and the surface tension (gammaA) of a reagent and the relation of each contact angle (costheta) are plotted the appropriate back. It asks for the surface tension (gammae) of the point that connect so-called each point of a JISUMAN plot, and the extension wire crosses the line of costheta=1 concerning this plot. This called-for surface tension is called a critical surface tension (= surface tension).

[0017] Here, since it is I . reagent regularity supposing it measures wettability (W) of various

material with the same arbitrary reagents, for example, water, surface tension gammaA in (1) formula becomes fixed.

RO., therefore wettability (W) and a contact angle (costheta) become proportionality. It can be said from above-mentioned I and RO that measuring wettability (W) of various material with the same reagent is asking for the contact angle (costheta) with the same surface tension (gammaA). On the other hand, in many cases, a JISUMAN plot serves as a straight line, and the inclination does not change extremely with material. As mentioned above, wettability comparison of material with the same reagent, for example, water, can say it also as surface tension comparison of material.

[0018] Although it is going to prevent generating of a worm-eaten-like picture with technology aforementioned JP,2-198476,A and given in JP,2-212867,A using a wettability small middle imprint material, in other words, this can be called what has prevented generating of a worm-eaten-like picture using a small middle imprint material of surface energy. [0019] b. A middle imprint object considers as multilayer composition, the thing (JP,62-293270,A, JP,5-204255,A, JP,5-204257,A, JP,5-303293,A) which aims at worm-eaten-like picture generating prevention on an imprint disposition, and the matter which was excellent in the mold-release characteristic at c. middle imprint body surface supply further by making material excellent in the mold-release characteristic into the maximum surface, and what aims at worm-eaten-like picture generating prevention (JP,58-187968,A) can classify into the technology of the above (4) on an imprint disposition. With the technology of the above (4), the surface tension of a middle imprint object was stopped low, the mold-release characteristic over a toner was raised, and the imprint nature to imprint material is improved. It is a well-known fact that the adhesion force between dissimilar material is expressed as a function of surface tension, and the adhesion force of a toner to a middle imprint object increases with the increase in surface tension. Here, in the case of a pure substance, surface tension is surface energy and homonymy. Moreover, as well as wettability if it generally is not a pure substance, surface tension is treated as a substitution property of surface energy. [0020] In the technology of the above (4), each adhesion force of a toner, an image support and a toner, a middle imprint object and a toner, and imprint material is force synthesizing all physical force that acts, such as an electrostatic force of each part material, and Van der Waals force. And although reduction-izing of the surface energy in a middle imprint object is convenient in a secondary imprint so that I may be understood from the aforementioned explanation, in a primary imprint, it not necessarily always does not necessarily act advantageously.

[0021] (5) the technical Nakama imprint body surface about removal of the toner filming layer of a middle imprint body surface is refreshed by filming polish etc., imprint nature is maintained, and the things (JP,5-273893,A, JP,5-307344,A, JP,5-313526,A, JP,5-323802,A, etc.) which aim at prevention of worm-eaten-like picture generating by the passage of time are mentioned [0022] among said technology of (1) - (4), temporarily, supposing the technical technical problem of (4) is attained and the surface tension of a middle imprint object is reduced as an ideal, it will stop generating filming of a middle imprint object, and the technology of (5) will serve as needlessness That is, it can be said that the technology of (5) is complement technology compensated with the technology of (4).

[0023] On the other hand, when performing the roller transfer through a roller as a means of a secondary imprint, it is easy to generate the worm-eaten picture in a secondary imprint process. It is based on two reasons, the following a and b.

a. In the case of a full color picture, toner thickness is thick, in addition to a bird clapper, with contact pressure with a roller, the mechanical adhesion force to a middle imprint object increases by increase of the mechanical adhesion force which is a non-Coulomb force between the front face of a middle imprint object and a toner occurring powerfully, i.e., roller ** by the pressure welding of a roller, the effective density of a toner increases, and Van der Waals force

increases by toner proximity, consequently the adhesion force between toners to a middle imprint object increases.

[0024] b. In process in which an image formation process is repeated and performed, cause the filming phenomenon of a toner in which a toner adheres to a middle imprint body surface in the shape of a film, and adhesion force occurs between a middle imprint body surface and a toner. That is, although selection use of surface tension or the small material of surface energy is generally carried out so that toner filming may not occur on a middle imprint object, (i "the adhesion force corresponding to the surface tension between a middle imprint object and a toner") will be generated in that case. And once toner filming occurs, although the adhesion force between "a middle imprint object and a toner" serves as (ii "the adhesion force determined with the surface tension of toners"), it is clear here. [of the adhesion force of (ii) being larger than the adhesion force of (i)] Since the adhesion force between toners increases, while an imprint is not partially made by the above, an omission phenomenon occurs, and it can be said that a worm–eaten picture is produced.

[0025] It is the U.S. patent as a means to avoid this inside omission phenomenon, about generating of the worm-eaten picture in a secondary imprint process. There is technology indicated by the No. 5,053,827 specification (METHOD AND APPARATUSFOR INTERMITTENT CONDITIONING OF A TRANSFER BELT).

[0026] The roller (conditioning mean) which consists of members which consist of material of the fluorine system which has surface energy smaller than the middle imprint hair side of belt side energy as a middle imprint object is applied to a middle imprint belt front face, and this U.S. patent has the indication by having the conditioning process which reduces the surface energy of a middle imprint belt front face.

[0027] Furthermore, the middle imprint belt using the polycarbonate is made into an example. The early surface energy is 37 – 38 dyn-cm, and if a conditioning process is not used, it will go up to 40 – 45 dyn-cm. If 40 dyn-cm are exceeded, in order to suppose that the fault of an imprint will occur and to avoid this fault As described above, the roller formed with the material which used the fluorine of 30 or less dyn-cm as the base is applied to a belt, the thin coat layer of fluorine material is formed in a front face, and it is said that a surface energy rise of a belt front face is suppressed. Furthermore, this U.S. patent has conversely the indication of the purport which fault generates in the imprint to a middle imprint belt from a photo conductor, when hair side of belt side energy is lowered too much.

[0028] In the image formation equipment using the middle imprint belt (19) shown in drawing 1 mentioned later, when we used the middle imprint belt made from the polycarbonate, in the secondary imprint, the worm-eaten-like picture generated them in the passage of time.
[0029] Although the fault of a secondary imprint was canceled when the experiment which carried out the optimum dose application of the zinc stearate was conducted on the middle imprint belt as lubricant, when the coating weight of a toner decreased, the picture of the letter of "a blur" occurred and the generating place was checked, having happened at the primary imprint process became clear.

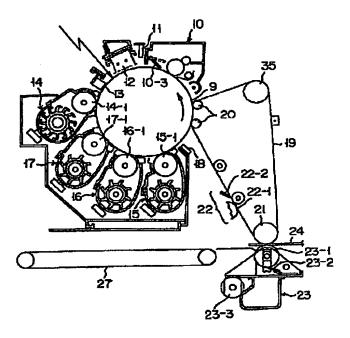
[0030] By the middle imprint belt using ETFE (ethylene-tetrapod FURORO ethylene copolymer) which is the material of a fluorine system, the above-mentioned "blur" phenomenon occurred from the first stage. As opposed to middle imprint hair side of belt side energy being suppressed by a certain level according to the aforementioned conditioning process, if this is checked with the conventional example Although the photo conductor which is a toner image support is grinding the front face with the cleaning-brush roller etc. A toner adheres to a front face in the shape of a film like a middle imprint belt with time, or Ozone, NOx, etc. are polluted by the electric discharge generation gas of a corona charger, surface energy goes up gradually, and it is thought that it is because a toner becomes easy to adhere to a photo conductor side mechanically and imprint nature is spoiled.

[0031] The black toner image imprinted as the image section reproduced in black toner

monochrome, such as the black character section, in the equipment which has the order of imaging which piles up an image to the middle imprint object other than the fault by which some toner images are not imprinted actualizes degradation of this imprint performance also as fault conversely imprinted at subsequent processes to a photo conductor in order of black, cyanogen, a Magenta, and yellow. Incidentally, it is thought that fault occurred from the first stage by the middle imprint belt of ETFE because the surface energy differences of a photo conductor front face and a middle imprint belt front face differed greatly in the initial state. [0032] In order to avoid such faults, when middle imprint hair side of belt side energy becomes high too much, with the technology concerning the aforementioned U.S. patent, it is carrying out to operating a conditioning process. A conditioning process is operated when the copy number of sheets decided beforehand is specifically exceeded.

[0033] However, it is clear un-arranging [which interrupts copy work and operates a conditioning process], and the middle imprint belt front face of be [it / in a fixed state / necessarily] is clear after the copy number of sheets always decided beforehand. [0034] Moreover, if it observes about the toner used, in order to prevent a worm-eaten picture, the method of raising the fluidity of a toner and making the volatility at the time of an imprint raising, and the method of adding a resin particle etc. to a toner and preventing the consolidation of the toners by the press at the time of an imprint are learned. However, when improving the fluidity of a toner too much, there is a case where become easy to generate the phenomenon in which a toner breaks up, and faithful reappearance of a character etc. becomes impossible at the time of an imprint.

Drawing selection [Repres ntative drawing]



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CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS EXAMPLE DESCRIPTION OF DRAWINGS DRAWINGS

[Translation done.]

* NOTICES *

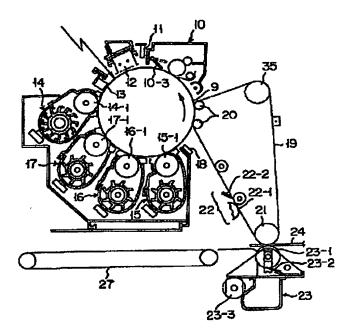
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EFFECT OF THE INVENTION

[Effect of the Invention] As mentioned above, it is this invention as explained in detail and concretely. In the image formation method using the middle imprint method at least Black, The amount of electrifications of a developer makes high the toner which consists of cyanogen, a Magenta, and a yellow color at the order developed on an image support. And it is a good imprint property's being acquired, being able to prevent worm-eaten and development called imprint dust by making the absolute value of the amount of electrifications into 10–30microc/g, and a toner's containing a hydrophobic silica at least further, and making the degree of condensation into 5 – 25%. Furthermore, the extremely excellent effect that a good imprint property is acquired and also a still better imprint property is acquired by setting the degree of coloring of a toner to 2.2–2.8, and setting a volume mean particle diameter to 4–9 micrometers is demonstrated.

Drawing selection [Representative drawing]



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[Translation done.]

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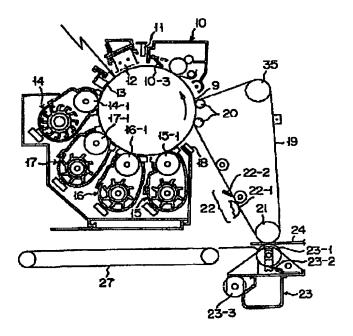
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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] Therefore, the purpose of this invention cancels the trouble in the above-mentioned conventional technology, and is in the image formation method using the middle imprint method to prevent the local poor imprint (worm-eaten) generated at the time of an imprint, and the poor repeatability of the picture by the dust of a toner.

Drawing selection [R presentative drawing]



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JAPANESE [JP,10-207164,A]

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MEANS

[Means for Solving the Problem] The above-mentioned technical problem repeats the process which imprints the toner image on (1) "image support of this invention primarily on an endless-like middle imprint object two or more times, piles it up, and forms a transfer picture. In the image formation method using the middle imprint method which bundles up the heavy transfer picture on this middle imprint object, and was secondarily imprinted on imprint material At least the toner which consists of black, cyanogen, a Magenta, and a yellow color The amount of electrifications of the developer used for the order developed one by one on an image support is held highly. And the image formation method characterized by making the absolute value of the amount of electrifications of the developer used into 10-30microc/g", (2) The toner used the account of before " contains a hydrophobic silica at least. The degrees of coloring of each toner used the image formation method given [aforementioned] in (1) term characterized by the degree of condensation being 5-25% and the account of before (3) " are 2.2-2.8. It is solved by and the image formation method using the middle imprint method given [aforementioned] in (1) term characterized by the volume mean particle diameter of this toner being 4-9 micrometers." "Moreover, (4) Repeat the process which imprints the toner image on an image support primarily on an endless-like middle imprint object two or more times, pile it up, and a transfer picture is formed. In the image formation equipment using the middle imprint method which bundles up the heavy transfer picture on this middle imprint object, and was secondarily imprinted on imprint material At least the toner which consists of black, cyanogen, a Magenta, and a yellow color The amount of electrifications of the developer used for the order developed one by one on an image support is held highly. And the image formation equipment characterized by making the absolute value of the amount of electrifications of the developer used into 10-30microc/g", (5) The toner used the account of before " contains a hydrophobic silica at least. The degrees of coloring of each toner used the image formation equipment given [aforementioned] in (4) terms characterized by the degree of condensation being 5 - 25%" and the account of before (6) " are 2.2-2.8. It is solved by and the image formation equipment using the middle imprint method given [aforementioned] in (4) terms characterized by the volume mean particle diameter of this toner being 4-9 micrometers."

[0037] Although it passes through the process imprinted at once on imprint material (secondary imprint) after the toner of a color with which this inventions differ on a middle imprint object in the target image formation method laps, on a middle imprint object, each color toner is imprinted one by one from an image support (primary imprint). In this case, the fault that the amount of electrifications becomes easy to rise, the imprint property of the toner at the time of a secondary imprint will change with order of a primary imprint in order to receive many charge histories on a middle imprint object, and the color tone of a color picture will differ from an original manuscript produces the toner imprinted primarily first. Such fault is canceled by this invention. Hereafter, this invention is explained in detail.

[0038] It became clear that the imprint property at the time of the secondary imprint of two or

more colors regularity-izes by the color, and the color picture of the stable color tone is obtained by making the amount of electrifications of the developer to be used high in order of development as a result of this invention persons' examination. Moreover, the absolute value of the amount of electrifications of a developer is desirable, in order that considering as 10-30microc/g may be stabilized and it may acquire an imprint property.

[0039] Furthermore, in order to attain the purpose of this invention, it is necessary to give a suitable fluidity, and as for the degree of condensation, to the toner used for this invention, it is desirable that it is 5 - 25%. When the degree of condensation is less than 5%, the dust of the toner at the time of an imprint may be generated, and, in an adult case, worm-eaten may occur rather than 25% at the time of an imprint.

[0040] Measurement of the degree of condensation of a toner can be performed by the following methods. That is, using a powder circuit tester (Hosokawa Micron CORP. make), a screen (75 micrometers of openings, 45 micrometers, and 22 micrometers) is arranged in this order from a top, a 2g toner is supplied to the screen of 75 micrometers of openings, vibration is given for 30 seconds with the amplitude of 1mm, the weight of 0.5, and 0.3 and 0.1 is applied and added to each measurement, and the toner weight of each plus sieve after vibration is computed by percentage.

[0041] Moreover, it is effective in order that a hydrophobic silica may attain the purpose of this invention as an additive mixed especially to a toner. A hydrophobic silica usually shows the thing of the 50% or more of the degrees of hydrophobing here. The degree of hydrophobing of a silica impalpable powder is controllable by carrying out surface treatment (hydrophobing processing) of the front face of a silica impalpable powder with a silane system compound. That is, a silane compound is made to react to the hydroxyl group combined with the silica impalpable powder, and it can control by replacing a hydroxyl group by the siloxyl machine etc. Therefore, the degree of hydrophobing is the rate of the hydroxyl group which disappeared by the above-mentioned reaction among the hydroxyl groups which existed before hydrophobing. Hydrophobing processing is performed by making a dialkyl dihalogen-ized silane, a trialkyl halogenation silane, hexa alkyl disilazane, an ARUKIRUTORI halogenation silane, etc. react to a silica impalpable powder under an elevated temperature.

[0042] Moreover, the degree of hydrophobing of the aforementioned silica impalpable powder can be measured by the following method. That is, 50ml of water is put into a 200ml beaker, and a 0.2 moreg silica impalpable powder is added, and ml of the dropping methanol when the silica impalpable powder which adds a methanol and is appearing from the buret with which the nose of cam was immersed underwater beginning to sink, and sinking completely at the time of dropping, agitating gently by the magentic stirrer, -- reading -- degree of hydrophobing ={-- ml of a dropping methanol -- a number -- /(ml of 50+ dropping methanol number)]x100 (%) since -- it asks The degree of hydrophobing of a silica impalpable powder is so high that the value of the degree of hydrophobing is large since the silica impalpable powder which carried out the role of a surfactant in this case, and has floated with dropping of a methanol distributes a methanol underwater through a methanol. Moreover, 0.1-2.0 weight section addition of the content of the hydrophobic silica used for this invention is carried out to the toner particle 100 weight section. Moreover, it is a 0.3 - 1.5 weight section grade especially preferably. [0043] Furthermore, it became clear to phenomena, such as worm-eaten [at the time of the above-mentioned imprint], and dust of a toner, that the direction with little coating weight per unit area of the toner developed is advantageous as a result of this invention persons' examination.

[0044] That is, although a toner is further transferred to imprint material, when there is much coating weight of a toner, condensation of toners is promoted by the consolidation of a toner by the press at the time of an imprint, and it is easy to generate dust from an image support, without [a middle imprint object and] becoming easy to generate worm-eaten and being able to perform transition of a still more faithful toner.

[0045] Moreover, although it is generally desirable for high-definition-izing to diameter of a granule]-ize a toner, it becomes easy to generate the aforementioned worm-eaten phenomenon by diameter of a granule]-izing. Therefore, although it is desirable to lessen development coating weight of a toner further, picture concentration runs short in this case, and a high-definition picture is no longer acquired.

[0046] Therefore, it is necessary to raise the degree of coloring of a toner. On the other hand, when there is too little coating weight of a toner, the feeling of ZARATSUKI of a picture comes to be conspicuous. As for the degree of coloring of these points to a toner, being referred to as 2.2–2.8 is desirable.

[0047] The degree of coloring of a toner was measured as follows here. That is, toner 1 mg/cm2 was made to adhere to a transfer paper (the Ricoh make, Types 6000 and 70W), the fixing equipment of the Ricoh pulley tail 550 was passed, and picture concentration was measured for the fixing picture with the 938 SUPEKUTORO densitometer made from X-Rite. Moreover, as for the volume mean particle diameter of the toner used for this invention, it is desirable to be referred to as 4-9 micrometers. While the feeling of ZARATSUKI of a picture is lost by being referred to as 9 micrometers or less, a picture with high resolution is acquired. Moreover, in the case of less than 4 micrometers, worm-eaten [at the time of an imprint] may occur. [0048] Hereafter, the toner and developer which are used for this invention are explained in detail. As a binder resin used in the toner used by this invention, all the things used as a binding resin for toners from the former are applied. Specifically Styrene, such as polystyrene, poly p-chloro styrene, and polyvinyl toluene, and the polymer; styrene-p-chloro styrene copolymer of the substitution product, A styrene-propylene copolymer, a styrene-vinyltoluene copolymer, A styrene-vinyl naphthalene copolymer, a styrene-methyl-acrylate copolymer, A styrene-ethyl-acrylate copolymer, a styrene-butyl-acrylate copolymer, A styrene-acrylic-acid octyl copolymer, a styrene-methyl-methacrylate copolymer, A styrene-ethyl-methacrylate copolymer, a styrene-methacrylic-acid butyl copolymer, A styrene-alpha-crawl methyl-methacrylate copolymer, a styrene acrylonitrile copolymer, A styrene-vinyl methyl-ether copolymer, a styrene-vinyl ethyl ether copolymer, A styrene-vinyl methyl ketone copolymer, a styrene-butadiene copolymer, A styrene-isoprene copolymer, a styrene-acrylonitrile-indene copolymer, Styrene system copolymers, such as a styrene-maleic-acid copolymer and a styrene-maleate copolymer; A polymethylmethacrylate, Poly butyl methacrylate, a polyvinyl chloride, polyvinyl acetate, polyethylene, Polypropylene, polyester, a polyvinyl butyl butyral, a polyacrylic resin, These are independent, or rosin, denaturation rosin, a terpene resin, phenol resin, aliphatic series or an alicycle group hydrocarbon resin, an aromatic system petroleum resin, chlorinated paraffin, paraffin wax, etc. are mentioned, and they are used by two or more sorts, mixing. In these, especially desirable things are a polyol resin, polyester, and an epoxy resin in this invention.

[0049] In the toner of this invention, in order to give suitable electrification for a toner, it is desirable to make an electrification control agent contain. As an electrification control agent in this case, the matter of a white system is added from the transparent plane color which does not spoil the color tone of a color toner, and what can carry out stabilization grant of the toner electrification nature is desirable to negative polarity or straight polarity. Specifically, as a thing of straight polarity, quarternary ammonium salt, an imidazole metal complex, salts, etc. are used, and a salicylic-acid metal complex, salts, organic boron salts, a calyx allene system compound, etc. are used as a thing of negative polarity.

[0050] Moreover, the stain pigment as a coloring agent which can obtain the toner of yellow, a Magenta, cyanogen, and a black color can be used. for example, independent in any conventionally well-known stain pigments, such as stain pigments, such as carbon black, lamp black, ultramarine blue, the aniline bule, a copper phthalocyanine blue, a Phthalocyanine Green, Hansa yellow G, rhodamine 6G, a lake, a KARUKO oil blue, chrome yellow, a Quinacridone, a benzidine yellow, a rose bengal, and a triaryl methane system color, — or it can be used, mixing

₹`

The amount of these coloring agents used is usually 3 - 20 % of the weight preferably one to 30% of the weight to a binding resin.

[0051] Moreover, it is possible to add hydrophobic titanium oxide, a hydrophobic alumina, etc. in order to raise the fluidity other than the hydrophobic silica shown in this invention as an external additive added to a toner. In addition, you may add fatty—acid metal salts (a zinc stearate, aluminum stearate, etc.), a polyvinylidene fluoride, etc. if needed.
[0052] Moreover, it is possible to give electrification to a toner, to mix with a carrier in order to convey a toner in a development unit, and to use it as a two component developer. That by which iron powder with a particle size of about 20–200 micrometers, nickel powder, ferrite powder, the glass bead, etc. coated the front face with the mixture of these resins, such as a styrene–acrylic–ester copolymer, a styrene–methacrylic–ester copolymer, an acrylic–ester polymer, a methacrylic–ester polymer, silicone resin, polyamide resin, an ionomer resin, and polyphenylene sulfide resin, by making these into a core material as a carrier again is used. [0053]

[Embodiments of the Invention] Hereafter, this invention shoots based on drawing 4, and the example of the image formation method and the example of equipment are further explained to a detail. In the equipment of drawing 4, the color picture data from the color scanner which is not illustrated are changed into a lightwave signal, and an electrostatic latent image is formed in a photo conductor (9) of the write-in optical unit which performs the optical writing corresponding to the manuscript picture and which is not illustrated. This optical unit is well-known in itself, and consists of a laser diode, a polygon mirror, a polygon motor, an image formation lens, a reflective mirror, etc. a photo conductor (9) -- an arrow -- like -- a counterclockwise rotation -- rotating -- although -- The cleaning unit which contains a front [cleaning] electric discharge machine, a KUNININGU roller, and a cleaning blade (10-3) in the surroundings of it (10), electric discharge -- a lamp -- (-- 11 --) -- electrification -- a vessel -- (-- 12 --) -potential -- a sensor -- (-- 13 --) -- Bk -- a development counter -- (-- 14 --) -- C -- a development counter -- (-- 15 --) -- M -- a development counter -- (-- 16 --) -- Y -- a development counter -- (-- 17 --) -- development -- concentration -- a pattern -- a detector -- (-- 18 --) -- middle -- an imprint -- a belt Each development counter (14) - (17) consists of a development paddle which rotates in order to pump up and agitate development - (17-1) and the sleeve (14−1) which are rotated so that a developer may be made to counter a photo conductor (9), in order to develop an electrostatic latent image, and a developer, a toner concentration detection sensor of a developer, etc. Here, the example which set sequence (color toner formation sequence) of development operation to Bk, C, M, and Y explains operation below (however, sequence is not restricted to this).

[0054] If copy operation understands and is carried out, the read of Bk image data will start from timing predetermined with the color scanner which is not illustrated, and the optical writing by the laser beam and latent-image formation will start based on this image data (Bk latent image is called hereafter.). Suppose that it is the same also about C, M, and Y. That development should be made possible from the point of this Bk latent image, before a latent-image point arrives at the development position of Bk development counter (14), the rotation start of the development sleeve (14-1) is carried out, and Bk latent image is developed with Bk toner (the amount of electrifications is held to the minimum). Then, although development operation of Bk latent-image field is continued, when Bk latent-image back end section passes through Bk development position, it changes into a development non-operative state. This is made to complete at least before the following C picture point reaches. [0055] Subsequently, Bk toner image formed on the photo conductor (9) is imprinted on the front face of the middle imprint belt (19) by which the uniform drive is carried out with the photo conductor (9) (the toner image imprint to a middle imprint belt (19) from a photo conductor (9) is hereafter called "primary imprint"). A primary imprint is performed by impressing imprint bias voltage in the state where the photo conductor (9) and the middle imprint belt (19) contacted.

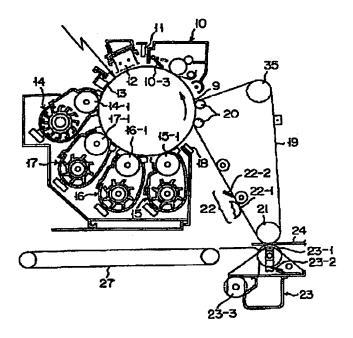
And the toner image of Bk, C, M, and Y which are formed in a middle imprint belt (19) one by one at a photo conductor (9) is aligned one by one to the same side, the primary transfer picture of 4 color piles is formed, and a package imprint (secondary imprint) is performed to a transfer paper after that. About the unit configuration of this middle imprint belt (19), and operation, it mentions later.

[0056] Although it progresses after Bk process in a photo conductor (9) side at C process which used C toner which next held the amount of electrifications small, C picture read by the color scanner begins from predetermined timing, and C latent-image formation is performed in the laser beam writing by the image data. After previous Bk latent-image back end section passed to the development position, and before the nose of cam of C latent image reaches, C development counter (15) carries out the rotation start of the development sleeve (15–1), and develops C latent image with C toner which held the amount of electrifications small to the 2nd. Although the development of C latent-image field is continued after that, when the latent-image back end section passes, it changes into a development non-actuation state like the case of previous Bk development counter. a mist [this] beam — it is made to complete before the following M latent-image point reaches About the process of M and Y, since the amount of electrifications uses the toner held greatly one by one and also operation of each image data read, latent-image formation, and development is the same as that of the process of above-mentioned Bk and C, explanation is omitted.

[0057] The middle imprint belt (19) is constructed over the imprint bias roller (20), the drive roller (21), and the follower roller (35), and drive control is carried out from the drive motor 2 which is not illustrated. A belt cleaning unit (22) is constituted by the brush roller (22–1) which the abbreviation half has exposed, rubber blade (22–2) **, etc., and carries out attachment—and—detachment operation according to the attachment—and—detachment mechanism which is not illustrated. The timing of this attachment—and—detachment operation is made to desert a middle imprint belt (19) side until the primary imprint of Y (this example four amorous glance of the last color) is completed from a print start, is subsequent predetermined timing and cleans by making a middle imprint belt (19) side contact according to the aforementioned attachment—and—detachment mechanism.

[0058] A paper imprint unit (23) is a paper imprint bias roller (23-1).

Drawing selection [Repr s ntativ drawing]



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EXAMPLE

[Example] Hereafter, an example explains this invention to a detail further. Example 1 <a black toner> Binding resin (polyol resin : softening temperature of 105 degrees C) The 100 weight sections Electrification control agent (fluorine-containing quarternary-ammonium-salt compound) The 0.8 weight sections Coloring agent (carbon black) After mixing enough with a blender, melting kneading of the 7 weight sections was carried out with 2 rolls which heated at 100-110 degrees C. Coarse grinding of the kneading object was carried out by the cutter mill after natural radiationnal cooling, the pulverizer using the jet stream removed fines after pulverization using pneumatic elutriation equipment, and the parent coloring particle was obtained. Furthermore, to this parent coloring particle 100 weight section, the hydrophobic titanium oxide 0.8 weight section of the 60% of the degrees of hydrophobing was mixed in the Henschel mixer, and the toner was obtained. Moreover, it mixed with the turbular mixer at a rate of 5 weight sections to the carrier 100 weight section which carried out the surface coat of the silicone resin to the ferrite particle of 50 micrometers of mean particle diameters, and this toner was made into the developer. In addition, the volume mean particle diameter of the obtained toner was [2.0 and the degree of condensation of 9.2 micrometers and the degree of coloring] 26, and the amount of electrifications of a developer was -16microc/g. Moreover, about cyanogen, the Magenta, and the yellow toner, the toner was created on the same conditions as a black toner in the following composition conditions, and the developer was acted similarly.

[0060]

ΙTa		

	シアントナー	マゼンタトナー	イエロートナー
結着樹脂	ポリオール樹脂:軟化。	点105℃ 100重	量部
帯電制御剤	含フッ素四級アンモニワ	ウム塩化合物	
	(0.9重量部)	(1.0重量部)	(1.2重量部)
着色剤	銅フタロシアニン	キナクリドン系顔料	ジスアゾ系顔料
	ブルー顔料		
	(C.I.Pigment Blue 15)	(C.I.Pigment Red 122)	(C.I.Pigment Yellow 17)
	(2.0重量部)	(4.0重量部)	(4.5重量部)
外添加剤	疎水性酸化チタン(疎2	k化度60%)	
	(0.8重量部)	(0.8重量部)	(0.8重量部)

The property of the obtained toner and a developer is shown in Table 7. Moreover, the good result was obtained, when set to the Ricoh pulley tail 550 the toner and developer which were

obtained, negatives were developed in order of black, cyanogen, a Magenta, and yellow, imprint nature (toner dust and worm-eaten) in the character section at the time of 4 color piles was evaluated and evaluation of the ZARATSUKI nature of the solid section and picture concentration was performed further. In addition, the method of evaluation was enforced as follows.

[0061] Worm-eaten rank rank 5 at the time of an imprint It is completely the non-generated rank 4. Rank 3 which worm-eaten [1-2] can check with a magnifier although it cannot check visually Rank 2 which worm-eaten [several] can check with a magnifier although it can hardly check visually Rank 1 which can check worm-eaten visually That most characters have fallen out can check visually. [0062] Rank rank 5 of the imprint dust at the time of an imprint It is completely the non-generated rank 4. Rank 3 which can check few dust with a magnifier although it cannot check visually Rank 2 which several dust can check with a magnifier although it can hardly check visually Rank 1 which dust can check visually BOYAKE of the character by dust can check visually (one 10 times the scale factor [Magnifier :] of this). [0063] ZARATSUKI nature rank rank 5 Uniform solid picture rank 4 Rank 3 which the nonuniformity of a picture can check slightly with a magnifier visually although it is uniform Rank 2 which can be checked with a magnifier although ZARATSUKI can hardly be checked visually Rank 1 which can check ZARATSUKI of a picture visually Monochromatic concentration is measured with the level picture concentration Macbeth reflection density meter (made in Macbeth) which ZARATSUKI of a picture is severe and cannot say as a solid picture.

[Table 2]

[0064] Example 2 [0065]

LIADIC Z				
	ブラックトナー	シアントナー	マゼンタトナー	イエロートナー
結着樹脂	ポリエステル樹脂	:軟化点110℃	100重量部	3
帯電制御剤	サリチル酸誘導体	亜鉛塩		
	(1.0重量部)	(1.0重量部)	(1.0重量部)	(1.0重量部)
着色剤	カーボンブラック	銅フタロシアニン	キナクリドン系顔料	アゾ系顔料
		プルー		
		(C.I.Pigment	(C.I.Pigment	(C.I.Pigment
		Blue 15)	Red 122)	Yellow 180)
	(7.2重量部)	(2.0重量部)	(3.8重量部)	(4.5重量部)
外添加剤	疎水性シリカ(疎	水化度70%)		
	(0.7重量部)	(0.7重量部)	(0.7重量部)	(0.7重量部)

The toner was created on the same conditions as ** and an example 1, specified quantity mixture was carried out with the same carrier, and it considered as the developer. The same evaluation as an example 1 was performed using the toner and developer which were obtained. In addition, the property of the obtained toner and a developer and also the evaluation result of quality-of-image quality are indicated to Table 7.

[0066] Example 3 [0067]

[Table 3]

	ブラックトナー	シアントナー	マゼンタトナー	イエロートナー
結着樹脂	ポリオール樹脂:	軟化点110℃	100重量部	
帯電制御剤	含フッ素四級アン	モニウム塩化合物	サリチル酸誘	導体亜鉛塩
	(1.0重量部)	(1.0重量部)	(1.0重量部)	(1.2重量部)
着色剤	カーボンブラック	飼フタロシアニン	キナクリドン系顔料	アゾ系顔料
		プルー		
		(C.I.Pigment	(C.I.Pigment	(C.I.Pigment
ļ		Blue 15)	Red 122)	Yellow 180)
	(9.0重量部)	(3.5重量部)	(6.0重量部)	(6.0重量部)
外添加剤	疎水性シリカ(疎	水化度80%)		
	(0.5重量部)	(0.6重量部)	(0.7重量部)	(0.7重量部)

The toner was created on the same conditions as ** and an example 1, specified quantity mixture was carried out with the same carrier, and it considered as the developer. The same evaluation as an example 1 was performed using the toner and developer which were obtained. In addition, the property of the obtained toner and a developer and also the evaluation result of quality-of-image quality are indicated to Table 7.

[0068] Example 4 [0069]

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	ブラックトナー	シアントナー	マゼンタトナー	イエロートナー
結者樹脂	ポリエステル樹脂	:軟化点98℃	100重量	常
帯電制御剤	含フッ素四級アン	モニウム塩/サリ	チル酸誘導体亜鉛塩	
	(1.0/0.5重量部)	(0.8/0.7重量部)	(0.6/0.8重量部)	(0.4/0.9重量部)
着色剤	カーボンブラック	飼フタロシアニン	キナクリドン系顔料	アゾ系顔料
	İ	ブルー		
		(C.I.Pigment	(C.I.Pigment	(C.I.Pigment
		Blue 15)	Red 122)	Yellow 180)
	(9.0重量部)	(3.5重量部)	(6.0重量部)	(5.8重量部)
外添加剤	疎水性シリカ(疎	水化度80%)		
	(0.6重量部)	(0.6重量部)	(0.7重量部)	(0.7重量部)

The toner was created on the same conditions as ** and an example 1, specified quantity mixture was carried out with the same carrier, and it considered as the developer. The same evaluation as an example 1 was performed using the toner and developer which were obtained. In addition, the property of the obtained toner and a developer and also the evaluation result of quality-of-image quality are indicated to Table 7.

[0070] The example 1 of comparison [0071]

[Table 5]

	ブラックトナー	シアントナー	マゼンタトナー	イエロートナー
結着樹脂	ポリオール樹脂:	軟化点105℃	100重量部	
帯電制御剤	含フッ素四級アン	モニウム塩化合物	1	
	(1.2重量部)	(0.8重量部)	(0.8重量部)	(0.8重量部)
着色剤	カーボンブラック	飼フタロシアニン	キナクリドン系顔料	アゾ系顔料
		ブルー		
		(C.I.Pigment	(C.I.Pigment	(C.I.Pigment
		Blue 15)	Red 122)	Yellow 180)
	(9.0重量部)	(3.5重量部)	(6.0重量部)	(6.2重量部)
外添加剤	球水性酸化チタン	(疎水化度20%)	
	(0.7重量部)	(0.7重量部)	(0.7重量部)	(0.7重量部)

The toner was created on the same conditions as ** and an example 1, specified quantity mixture was carried out with the same carrier, and it considered as the developer. The same evaluation as an example 1 was performed using the toner and developer which were obtained. In addition, the property of the obtained toner and a developer and also the evaluation result of quality-of-image quality are indicated to Table 7.

[0072] The example 2 of comparison [0073]

[Table 6]

<u></u>	-			
	ブラックトナー	シアントナー	マゼンタトナー	イエロートナー
結着樹脂	ポリエステル樹脂	:軟化点105℃	100重量部	3
帯電制御剤	含フッ素四級アン	モニウム塩化合物	J	
	(1.0重量部)	(1.0重量部)	(1.0重量部)	(1.0重量部)
着色剤	カーボンブラック	銅フタロシアニン	キナクリドン系顔料	アゾ系顔料
		ブルー		
		(C.I.Pigment	(C.I.Pigment	(C.I.Pigment
		Blue 15)	Red 122)	Yellow 180)
	(12重量部)	(5.0重量部)	(9.0重量部)	(9.0重量部)
外添加剤	疎水性シリカ(疎	水化度30%)		
	(0.8重量部)	(0.8重量部)	(8重量部)	(0.8重量部)
	(0.8重量部)	(0.8重量部)	(0.8重量部)	(0.8重量部

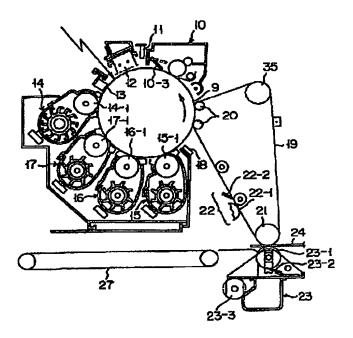
The toner was created on the same conditions as ** and an example 1, specified quantity mixture was carried out with the same carrier, and it considered as the developer. The same evaluation as an example 1 was performed using the toner and developer which were obtained. In addition, the property of the obtained toner and a developer and also the evaluation result of quality-of-image quality are indicated to Table 7.

[0074]

[Table 7]

				カラート	カラートナーの構成・特性	・報告				現像第	明备率		而像品質解佈試學	助抵		Г
	マナーの 括権和語	养 基独盟	の記載		外被存在		在	い合成	聚集度	工		版写性((色質力))	(#17.E)			₩.
	単金暦十			都加量		松加量	均数每				 	9.1	ĺ	サンシャ森	開金の海町	北京
				(重量部)		(食量物)	(m m)			(* t %)	(- u c/g)	520	ランク	レング(海色)	(B)	ļ
英雄紀 1	1777	よる	台が報機	0.8	孫本	0.8	9.2	2.0	38	5.0	36				1.1	
		霉	とかが補の	0.0	要の多	0.8	8.8	2.0	12	5.0		7	4	ص	-	C
	8120			1.0		0.8	9.5	2.1	28))	5	
	ーロエト			1,2		0.8	9.3	1.9	27		21				2.0	
芝施例2	7722 1 1 Just	# Jany	全级数464	1.0	1.00 建水性	0.7	9.3	2.1	18	5.1	24				1.8	
	ジンン	體	存用名為 60	1.0	奈	0. 7	9.2	1.9	16	678		4.5	4.5	4.6	1.9	С
	ケイゲンタ			1,0		0.7	9.4	1.8	15		27				1.8	
	イエロー			1.0		0, 7	9.6	1,9	14	6.5	28				2.0	
実施例3	実施例3 ブラック ばりた	4.46.2	金沙森代数	1.0	政体	0.5	8.1	2.4	23						2.2	
	シアン	新	アイニンと類(2)	1.0	*	0.6	8		8		S		ro	u	2.2	6
	4		まる表現事業	1,0		0.7	8,3		81					,	2.3)
	-a=/		体重鉛塩(B)	1,2		0.7	7.9	2.5	18	5.1	28				2.2	
英雄例4	実施例 4 ブラック ばい	4 5237		1,0/0,5	歌奏	0,6	6.8	2.4	20	2.0					2.2	
	ンプン	類	<u>8</u> /8	0,8/0,7	<u> </u>	0.6	6.5	2.2	20		22	מו	ص	ضا	2.2	Ø
	やだンタ			0.6/0.9		0.7	6.2	2.3	18	49			'		2.2	
	120-			0.4/0.9		0.7	6.4		19	4.9					2.2	
五数色1	比較例1 ブラック	14.14	學)業化學	1.2	1.2 群水性	0.7	6.2	2.3	33	5.5	30				2.2	
	ジブジ	美	の一次を	0.8		0.7	6.5	2.3	34	5, 5	16	~	~1	10	2.3	×
	やよンタ			0.8		0.7	6.8	2.3	33	5.4	15				2.2	
	イエロー			0.8		0.7	6.4	2.3	35	5.6	16				2.2	
打教 館2	比較何2 ブラック	4.65 at 1	含7y素(基	1.0	1.0 群大年	0.8	9.2	3.0	16	5.0	24				2.5	
	ジンソ	翻	アペークム塩(6)	1.0	\$ 0.00 \$	0.8	9.1	3.1	15	5, 0	20	4	7	8	2.4	×
	マピンク			1.0		0.8	9.4	3.0	16						2.4	
	イエロー			1.0		0.8	9.6	3.1	15	5.0	24				2.5	

Drawing selection [Representativ drawing]



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CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS EXAMPLE DESCRIPTION OF DRAWINGS DRAWINGS

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is drawing showing the example of a picture of the shape of worm-eaten [which is generated in the conventional image formation method].

[Drawing 2] It is drawing explaining picture generating of the shape of high surface roughness and worm-eaten in the conventional image formation method.

[Drawing 3] It is drawing explaining picture ***** of the shape of worm-eaten [in the conventional image formation method].

[Drawing 4] It is drawing explaining the example of image formation equipment and the example of a method of this invention.

[Description of Notations]

w Worm-eaten

I Electrode

II Electrode

II-1 Electrode heights

II-2 Electrode crevice

Gp Air gap

T Toner

9 Photo Conductor (Image Support)

10 Photo Conductor Cleaning Unit

10-1 Front [Cleaning] *****

10-2 Brush Roller

10-3 Rubber Blade

11 Electric Discharge Lamp

12 Electrification Machine

13 Potential Sensor

14 Bk Development Counter

14-1 Development Sleeve

15 C Development Counter

15-1 Development Sleeve

16 M Development Counter

16-1 Development Sleeve

17 Y Development Counter

17-1 Development Sleeve

18 Development Concentration Pattern Detector

19 Middle Imprint Belt

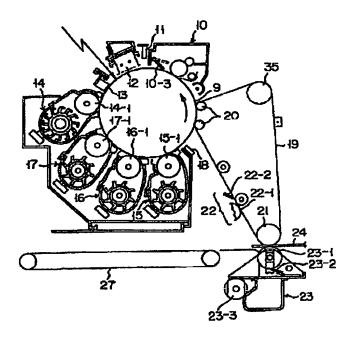
20 Imprint Bias Roller

21 Drive Roller

22 Belt Cleaning Unit

- 22-1 Brush Roller
- 22-2 Rubber Blade
- 23 Paper Imprint Unit
- 23-1 Paper Imprint Bias Roller
- 23-2 Roller Cleaning Blade
- 23-3 Attachment-and-Detachment Mechanism
- 24 Transfer Paper
- 27 Conveyance Belt
- 35 Follower Roller

Drawing selection [R presentative drawing]



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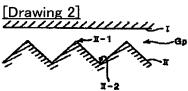
JAPANESE [JP,10-207164,A]
CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS EXAMPLE DESCRIPTION OF DRAWINGS DRAWINGS
[Translation done.]

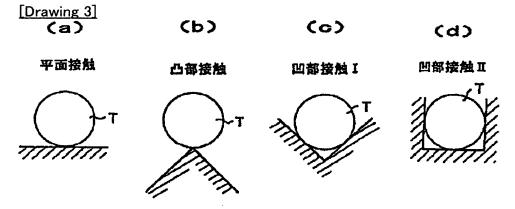
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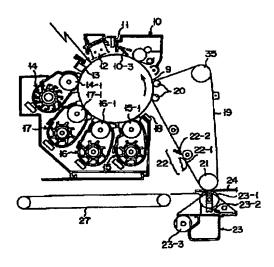
DRAWINGS



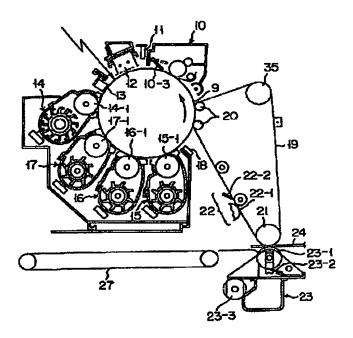




[Drawing 4]



Drawing selection [Representativ drawing]



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(11)特許出顧公開番号

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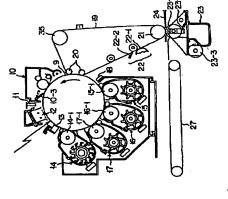
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FI	G03G			
裁別記号		114		
	15/01		60/6	80/6
51) Int CL.	G03G			

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(54) 【発明の名称】 中間転写方式を用いた画像形成方法

(51) [要約]

【解決手段】 像担持体上のトナー像を無端状の中間転 写体に一次転写する工程を複数回繰り返して重ね転写画 像を形成し、この中間転写体上の重ね転写画像を一括し て転写材上に二次転写するようにした中間転写方式を用 いた画像形成方法において、少なくとも、ブラック、シ アン、マゼンタ、イエロー色からなるトナーを、像担持 保持し、かつ用いられる現像剤の帯電量の絶対値を10 **体上に順次現像する順に、用いる現像剤の帯電量を高く** トナーのチリによる画像の再現性不良を防止すること。 て、転写時に発生する局所的な転写不良(虫喰い)や、 ~30μc/gとすることを特徴とする画像形成方法。 【輠題】 中間転写方式を用いた画像形成方法におい



[特許請求の範囲]

2 ・た画像形成方法において、少なくとも、ブラック、シ 【語状項1】 像担持体上のトナー像を無端状の中間転 写体に一次転写する工程を複数回繰り返して重ね転写画 **に転写材上に二次転写するようにした中間転写方式を用 保持し、かつ用いられる現像剤の帯電量の絶対値を10** 【請求項2】 前記用いられるトナーが、少なくとも疎 像を形成し、この中間転写体上の重ね転写画像を一括し アン、マゼンタ、イエロー色からなるトナーを、像担持 **体上に頃次現像する順に、用いる現像剤の帯電量を高く** 水性シリカを含有し、擬集度が5~25%であることを ~30ょc/ほとすることを特徴とする画像形成方法。 特徴とする請求項1記載の画像形成方法。

2. 2~2. 8であり、かつ駭トナーの体積平均粒径が 【請求項3】 前記用いられる各々のトナーの着色度が 4~9μmであることを特徴とする請求項1記載の中間 **転写方式を用いた画像形成方法。**

3020号公報) がある。

[発明の詳細な説明]

[発明の属する技術分野] 本発明は、複写機、プリンタ 一、ファクシミリなどの電子写真方式を用いた画像形成 ト等の中間転写体を介在させて、像担持体から中間転写 哲写画像を転写材へ転写する二次転写の各転写工程を経 方法及び画像形成装置に関し、詳しくは、中間転写ベル 体へトナー像を転写する一次転写、中間転写体上の一次 「画像形成を行う画像形成方法及び画像形成装置に関す

[0002]

30 れる複数の可視の色現像画像を無端状に走行する中間転 写体、例えば中間転写ペルト上に順次重ね合わせて一次 る、フルカラー画像形成装置において各色トナー像の重 【従来の技術】像担特体、例えば啓光体上に順次形成さ 転写し、この中間転写体上の一次転写画像を転写材に一 括して二次転写する中間転写方式の画像形成方法及び装 置が知られている。とりわけ、中間転写方式は、色分解 された原稿画像をブラック、シアン、マゼンタ、イエロ ーなどのトナーによる域色混合を用いて再現するいわゆ お転写方式として採用されている。

S 4 生しないようにすることであり、つまり、転写性を向上 て、色現像画像を構成するトナーの一次転写時及び二次 転写時における局部的な転写抜けに起因して、最終的な 画像媒体である転写紙等による転写材上の画像中に、局 生ずることがある。このような虫喰い状の画像の例を図 ラインが途切れるように転写抜けを生ずることにより発 生する。かかる異常画像をなくするには、転写抜けが発 部的に全くトナーが転写されず、所謂虫喰い状の部分を 1に示す。虫喰い状の画像は、面積画像の場合には図1 に符号(w)で示すように、ある面積を以って転写抜け となることにより発生する他、ライン画像の場合には、 【0003】このような画像形成方法及び装置におい

特開平10-207164

3

させればよく、そのための技術として、以下に述べるよ っな技術が撮歌されている。

[0004] 転写性を向上させるための既存の技術は、

a. 中間転写体にエラストマーを使用し、かつ、中間転 報)、および、b. 中間転写体の装面粗度を規定し、転 63-194272号公報、特開平4-303869号 との密着性を向上させて、転写性を向上、虫喰い状画像 写性向上、虫喰い状画像発生防止をはかるもの(特開昭 公報、特開平4-303872号公報、特開平5-19 写体の数面粗度を規定することで、中間転写体と転写材 発生防止をはかるもの (特関平3 – 2 4 2 6 6 7 号公 (1) 中間転写体の表面相度低域に関する技術

一次転写工程における像担持体と中間転写体間、二次転 写工程における中間転写体と転写材間、でのトナー転写 に関するもので、放電現像をともなうともいえる。ここ で、中間転写体装面が極端な凹凸状の装面粗度であると [0005] これら (1) の簡単に属する従株技術は、 20 すると、凸部上と凹部上でのトナーに対する転写電界

凸部転写電界>凹部転写電界

[0006] その理由は、次のように説明できる。すな わち、図2を参照するに、平坦な装面を有する電極 となり、凸部転写電界が相対的に大きくなる。

と転写材間などの転写媒体間のトナー転写館界は、これ を想定したとき、像担特体と中間転写体間、中間転写体 p)を介して対面する鋸齿状の数面を有する電極 (II) (1) と、この転摘(1)に微小なエアギャップ(G **で情砂棋存置のHアポナップ観彫かした、**

―次航耳電界・・・像拍枠体/中間航母体間のエアギャ ップ電界

二次転写電界・・・中間転写体/転写材間のエアギャッ

で説明できる。

イアス電圧が印加された場合、これら電極間の距離が離 [0007] 図2において、凸部を (11-1)、凹部を (II-2) とすると、虹極(I)、電極 (II) に転写べ れている回部(II-2)に比較し、距離が短い凸部(II

となる。同様の理由により、中間転写体の変面粗度が大 凸部エアギャップ電界>凹部エアギャップ電界 きい場合の凸部、凹部のエアギャップ電界は、 -1)に放電が集中する。つまり

凸部転写電界>凹部転写電界

【0008】このようなことから、凸部、凹部両者のト ナー形状を同一とみなした場合、凹部におけるトナーに 比較して凸部におけるトナーの方が大きい電界中に位置 る。つまり、凸部に比較して、回部は低写されにくいと するので、大きな静電的力を受けて転写されやすくな

いえる。また、凹部のデッチなどに位置するトナーの中 間転写体に対する付着力は、凸部のエッジなどに位置す るトナーの中間転写体に対する付着力よりも大きいの で、回部は飯母されにくいといえる。

如き凸部接触に比べて、図3 (c)、図3 (d) にそれ [0009] つまり、図3において模視的に、1粒のト ナーを符号(T)で、接触面をハッチングを施した面で それぞれ示したとすると、トナーの実効付着面は、図3 (a) に示した如き平面接触、及び図3 (b) に示した 5、実効付着面の大小は付着力の大小と同義となる。し ぞれ示した如き凹部接触の方が接触面積が大きくなる。 **画) に対してファン・デル・ワールス力が働くことか** 接触する互いの材料が同一系の場合、近接面 (=付着

2

四部付着カ>凸部付着カ

趣して一定値に抑制することは、周知である。したがっ [0010]以上のことから、按面の凹凸による転写性 の差異が実質上問題とならないレベルまで、中間転写体 このことは、感光体にもいえることであるが、感光 **遡り、かかる感光体についてその要面粗度を転写性を考** て、凹凸による転写性の差異が実質上問題とならないレ 体の表面粗度は、古くはSe 核光体を用いたドラムまで **表面の租度は粗さが少ない傾向にするのがよいといえ** ペルまで、中間転写体装面の租度を調整することは、 喰い状画像の発生防止にとって、意味がある。

ន

る回凸の場合には、観界強度は単に回部一凸部間の距離 【0011】しかしながら、中間転写体の装面粗度の低 うな常に一定の形状の凹凸ばかりではない。形状の異な により定まるものでもなく、例えば凸部が同じ高さであ あるか或いは気荷の集中がさほどない頂部面積を有する 域化には限度があり、また、装面の凹凸は図2に示すよ ってもその幅の大小の違いによる電荷集中度の違い、例 えば凸部の先端が電荷の集中し易い尖った鋭角のもので 純角のものであるかの違いによっても異なり、現実の各 転写体相互聞における問題はさほど単純ではない。

【0012】 (2) 転写媒体間での線速度差の設定に関

異常画像発生防止をはかるもの(特開平2-21388 転写媒体間の繰速度を規定し、転写性向上、虫喰い状の 2号公報)が挙げられる。

し、戯光体・中間転写体の速度差に起因する機械的な力 一定の梯速度整がある場合は、転写に際してトナーに対 中間転写体との間の転写である一次転写を例にして説明 でトナーを中間転写体側に移行するように電気的な力を 作用させなければならない。 しかるに、感光体と中間転 写体との間に静速度差を設ける場合、つまり、両者間に 【0013】この(2)の浴米技術について、敷光体と 核光体とトナーとの間に働く付着力に対し転写電界のみ する。 愍光体と中間転写体の線速度が等しい場合には、

と転写電界による電気的な力の双方を作用させることが でき、したがって、機械的な力と転写電界による力の双 性欠如による現象と考えると、転写媒体間(感光体と中 閲転写体間)に線速度差を設けた方が虫喰い状の異常画 像の解消に有利であるといえる。しかしながら、転写媒 **本間に繰速度差を設ける場合にはその繰速度差によりト 方を作用させることのできる、後者の方が転写性に優れ** ていると云うことができ、虫喰い状画像を微視的な転写 ナー像に剪断力を与え像の蚤みを生じ勝ちになる。

転写ニップ圧を特定化し、転写性向上、虫喰い状画像発 特開平4-284479号公報)が挙げられる。これら の(3)の従来技術について、戯光体と中間転写体との **介在するトナーは、押圧されていることとなる。この押** デル・ワース力は増大し、また、トナーの疑集によるト ナー粒子構成材料間の引力も増大する。これらの理由か 5、転写性の観点から、虫喰い状画像の解消には、転写 間の転写である一次転写を例にして説明する。一次転写 に際して感光体、中間転写体は機械的又は静電力により **甲圧されている(転写ニップ圧)。 つまり、両者の間に** 圧によるトナー粒子相互間距離の近接に伴い、ファン・ 生防止をはかるもの(特開平1-177063号公報、 【0014】(3)転写ニップ圧の低減に関する技術 ニップ圧を低くするのが望ましいといえる。

【0015】しかしながら、転写媒体相互をより密着さ せて相互間距離を小さくするすることはトナーの正確な 医写位置関係の保持のために有利であり、この観点から すれば転写ニップ圧の低域化には限度がある。

【0016】(4)中間転写体の要面エネルギーの低減 に関する技術

の付着力を意味する。付着力とは、異種の物質を引き離 a. 中間転写体材料の濡れ性を小に特定化し、転写性向 98476号公報、特開平2-212867号公報)が 上、虫喰い状画像発生防止をはかるもの(特開平2-1 挙げられる。ここで、潘れ性とは、液体と固体との間で すのに要するエネルギーであり、したがって、液体の殻 とし、これら液体と固体間に作用する付着力をWで示す 面張力をッA、固体の上に液体を置くときの接触角を B

 $W = \gamma_A (1 + cos\theta) \cdots (1)$

する。この作図にかかる、いわゆるジスマンプロットの 各点を結びその延長線が c o s θ = 1 の線と交わる点の で扱わすことができる。Xなる材料の要面張力 (=臨界 寮面張力 (ye)を求める。この求められた袰面張力を (vk) とそれぞれの接触角 (cosθ) の関係を作図 数面張力(y k)の異なる試薬を材料X上に滴下し、接 **要面張力)は以下の方法で求めることができる。即ち、** 触角(cosβ)を測定し、然る後、試薬の装面張力 臨界表面張力 (=装面張力) と称する。 4

【0017】ここで、任意の同一試薬、例えば水で、 50 種材料の濡れ性 (W) を測定したとすると、

イ. 試薬一定であるから、(1)式における装面張力ッ

ロ. したがって、循れ性 (W) と接触角 (cosθ) は 比例関係になる。

測定することは同一效面張力(vA)で接触角(c o s β)を求めているといえる。一方、ジスマンプロットは 上記イ、ロより、同一試験で各種材料の循れ性(W)を 異なることはない。以上より、同一試薬、例えば水によ 多くの場合、直線となり、その勾配は材料により極端に る材料の濡れ性比較は、材料の要面張力比較ともいえ

しようとしているが、これは言い換えれば、要面エネル 【0018】前記特開平2-198476号公報、特開 平2-212867号公報記載の技術では、隠れ性の小 さい中間転写材料を用いて虫喰い状の画像の発生を防止 **ギーの小さい中間転写材料を用い、虫喰い状の画像の発** 生を防止しているものといえる。

虫喰い状画像発生防止をはかるもの(特開昭62-29 数面張力の増加に伴い、中間転写体に対するトナーの付 平5-204257号公報、特開平5-303293号 公戦)、及び、c.中間転写体表面に離型性に優れた物 質を供給し、転写性向上、虫喰い状画像発生防止をはか (4)の技術に分類できる。上記(4)の技術では、中 間転写体の按面張力を低く抑え、トナーに対する離型性 を向上させ、転写材に対する転写性を改善している。異 着力が増大することは周知の事実である。ここで、純物 質の場合、装面張力は装面エネルギーと回義である。ま 3270号公報、特開平5-204255号公報、特開 た、一般的に箱物質でなくとも、確れ性と回模に敷面張 **猛物質問の付着力は、按面張力の関数として接わされ、** 【0019】b.さらに、中間転写体を多層構成とし、 唯型性に優れた材料を最装層とすることで転写性向上、 力は要面エネルギーの代用特性として扱われている。 **るもの (特開昭58-187968号公報) も前記**

る数面エネルギーの低減化は、二枚転写においては好都 [0020] 上記(4) の技術において、トナーと像担 合であるが、一次転写においては必ずしも常に有利に作 持体、トナーと中間転写体、トナーと転写材の、各付着 等、作用する全ての物理的な力を総合した力である。そ して前記説明から理解されるように、中間転写体におけ 力は、各部材の静電気力、ファン・デル・ワールス力

【0021】(5)中間転写体装面のトナーフィルミン グ層の除去に関する技術 用するとは限らない。

シュして、転写性を維持し、経時による虫喰い状画像発 526号公報、特開平5-323802号公報等)が挙 報、特開平5-307344号公報、特開平5-313 中間転写体安面をフィルミング研磨などによりリフレッ 生の防止をはかるもの(特開平5-273893号公

げられる。

特開平10-207164

3

[0022] 前記した (1) ~ (4) の技術のうち、仮 りに、(4)の技術課題が違成されて中間転写体の接面 張力が理想とおりに低減されたとすると、中間転写体の フィルミングは発生しなくなり、(5)の技術は不要と なる。つまり、(5)の技術は例えば(4)の技術を補 う権完技術であるといえる。

転写を行う場合に発生しやすい。それは、次のa、bの は、二次転写の手段として、ローラを媒介とするローラ [0023] 一方、二次転写工程における虫喰い画像 2 つの単由による。

に加え、ローラによる接触圧力により、中間転写体の安 力に発生すること、つまり、ローラの圧接によるローラ デル・ワールス力が増大し、その結果、中間転写体への a. フルカラー画像の場合、トナー層卓が早くなること 面とトナー間の非クーロン力である機械的な付着力が強 圧の増大により中間転写体への機械的付着力が増大し、 トナーの実効密度が増大し、トナー近接によりファン トナー間付着力が増大する。 【0024】b. 画像形成プロセスを繰り返し実行する 過程において、中間転写体要面にトナーがフィルム状に 付着するトナーのフィルミング現象を起こし、中間転写 般的に、中間転写体にはトナーフィルミングが発生しな 体とトナー間の装面張力に見合う付着力」は発生してし いように安面張力又は安面エネルギーの小さい材料が溺 まう。そして、ひとたび、トナーフィルミングが発生す ると、「中間転写体とトナー」との間の付着力は、(ii) **択使用されるが、その場合においても、(i)「中間転写** 「トナー同士の牧面扱力で決定される付着力」となる 体按面とトナーとの間に付着力が発生する。つまり、 2

きいことは明白である。以上により、トナー間付益力が 増大することから、転写が部分的になされない中抜け現 が、ここで、(i)の付着力よりも(ii)の付着力の方が大 象が発生し、虫喰い画像を生ずるといえる。

ATUSFOR INTERNITTENT CONDITIONING OF A TRANSFER BE 【0025】二次転写工程における虫喰い画像の発生に 関し、かかる中抜け現象を回避する手段として、米国特 許 第5,053,827号明細費 (METHOD AND APPAR

[0026] この米国特許には、中間転写体としての中 **面に当て、中間骶耳ベルト数面の数面エネルギーを域じ** 5コンディショニングプロセスを有する、との関示があ 間転写ベルトの按面エネルギーよりも小さい按面エネル チーを有するフッ╈米の材料からなる部材で構成されて いろローラ (conditioning mean) を中間転写ベルト玻 LT)に関示された技術がある。

\$

[0027] さらに、ポリカーボネートを用いた中間転 **写ベルトを具体例として、その初期の安面エネルギーは** 40dyn-cmを越えると転写の不具合が発生すると 31~38dyn-cmでめり、コンディショニングフ ロセスを用いないと40~45dyn-cmに上昇し、

しており、この不具合を回避するために、上記したよう に、例えば、30dyn-cm以下のフッ繋をペースと した材料で形成されたローラをベルトに当て、要面にフ ッ繋材料の薄いコート層を形成し、ベルト数面の数面エ に、この米国特許には、ベルトの表面エネルギーを下げ すぎると、逆に戯光体から中間転写ペルトへの転写に不 ネルギー上昇を抑制することが述べられている。さら 具合が発生する旨の開示がある。

ト(19)を用いた画像形成装置において、ポリカーボ ネートを材料とした中間転写ベルトを用いたところ、経 ン酸亜鉛を適量塗布した実験を行ったところ、二次転写 れを従来例と照らし合わせてみると、中間転写ベルトの り汚染されて徐々に安面エネルギーが上昇し、トナーは [0028] 我々は、後述する図1に示す中間転写ベル 【0029】中間転写ベルトに徴済剤として、ステアリ かすれ"状の画像が発生し、その発生場所を確認したと [0030] フッ繋系の材料であるETFE (エチレン **-テトラフロロエチレン共宜合体)を用いた中間転写べ** 数面エネルギーが前配コンディショニングプロセスによ りあるレベルに哲制されるのに対して、トナー像担特体 である感光体は、クリーニングブラシローラなどにより **要面を研磨しているものの、経時的に中間転写く// トと** ン、NO×など、コロナチャージャの放電生成ガスによ 感光体圓~機械的に付着し易くなり、 転写性が損なわれ 時にて二次転写において、虫喰い状の画像が発生した。 一枚転写工程にて起こっていることが判明した。 ルトでは、初期から上記"かすれ"現象が発生した。 同様に要面にトナーがフィルム状に付着したり、オゾ の不具合は解消されたが、トナーの付着量が減少し、 ることによるものと考えられる。

【0031】かかる転写性能の劣化は、トナー像の一部 が転写されない不具合の他に、プラック、シアン、マゼ 有する装置において、黒文字部などブラックトナー単色 で再現される像部として転写されたプラックトナー像が 以降の工程にて、核光体へ逆に転写されてしまう不具合 としても顕在化する。ちなみに、ETFEの中間転写べ 欧光体数面と中間転写ベルト数面の数面エネルギー差が ンタ、イエローの順に中間転写体へ像を重ねる作像順を ルトにて初期から不具合が発生したのは、初期状態にて 大きく異なっているためであると考えられる。

【0032】これらの不具合を回避するために、前配米 国特許にかかる技術では、中間転写ベルトの装面エネル ギーが高くなりすぎたときに、コンディショニングプロ められたコピー枚数を超えた時点にて、コンディショニ セスを動作させることにしている。具体的には、予め決

コピー枚数後には一定の状態になる訳でもないことは明 イショニングプロセスを動作させる不都合は明らかであ り、また、中間転写ペルト要面は、常に予め決められた [0033] しかしながら、複写作数を中断させコンデ

らかである。

と、虫喰い画像を防止するために、トナーの流動性を向 に樹脂粒子等を添加して転写時の押圧によるトナー同士 **一が散る現象が発生しやすくなり、文字等の忠実な再現** トナーの流動性を向上しすぎた場合には、転写時にトナ 【0034】また、用いられるトナーについて注目する 上させて転写時の移動性をアップさせる方法や、トナー の圧密を防止する方法が知られている。しかしながら、 ができなくなる場合がある。

「発明が解決しようとする課題】したがって、本発明の 目的は、上記従来技術における問題点を解消し、中間転 る局所的な転写不良(虫喰い)や、トナーのチリによる 写方式を用いた画像形成方法において、転写時に発生す 画像の再現性不良を防止することにある。 [0035]

「課題を解決するための手段」上記の課題は、本発明の

一次転写する工程を複数回繰り返して重ね転写画像を形 成し、この中間転写体上の重ね転写画像を一括して転写 材上に二次転写するようにした中間転写方式を用いた画 し、かつ用いられる現像剤の帯電量の絶対値を10~3 (1) 「像担持体上のトナー像を無端状の中間転写体に マゼンタ、イエロー色からなるトナーを、像担特体上に 像形成方法において、少なくとも、ブラック、シアン、 頃次現像する頃に、用いる現像剤の帯電量を高く保持 0 μ c / g とすることを特徴とする画像形成方法」、 ន

る工程を複数回繰り返して重ね転写画像を形成し、この 哲写するようにした中間転写方式を用いた画像形成装置 する前記(1)項記載の画像形成方法」及び(3)「前 記用いられる各々のトナーの着色度が2.2~2.8で あり、かつ数トナーの体積平均粒径が4~9μmである ことを特徴とする前記 (1) 項記載の中間転写方式を用 中間転写体上の重ね転写画像を一括して転写材上に二次 (2) 「前配用いられるトナーが、少なくとも疎水柱シ リカを含有し、凝集度が5~25%であることを特徴と いた画像形成方法」によって解決され、また(4)「像 担枠体上のトナー像を無端状の中間転写体に一次転写す において、少なくとも、プラック、シアン、マゼンタ

る前記(4)項記載の中間転写方式を用いた画像形成装 頃記載の画像形成装置」及び(6) 「前配用いられる各 - 一の体積平均粒径が4~9μπであることを特徴とす る順に、用いる現像剤の帯電量を高く保持し、かつ用い することを特徴とする画像形成装置」、(5)「前配用 **ゃのトナーの着色度が2.2~2.8であり、かつ核ト** イエロー色からなるトナーを、像担持体上に順次現像す られる現像剤の帯電量の絶対値を10~30μc/gと いられるトナーが、少なくとも疎水性シリカを含有し、 疑集度が5~25%であることを特徴とする前配(4) 置」により解決される。

【0037】本発明が対象とする画像形成方法において න

このような不具合は本発明により解消される。以下、本 写材上に一度に転写(二次転写)する工程を経るが、像 担持体から中間転写体上へは各色トナーが順次転写(一 - は中間転写体上でのチャージ履歴を多く受けるため帯 **電量が上昇しやすくなり、二次転写時のトナーの転写特** 性が一次転写の順により異なり、カラー画像の色調がオ **次転写)される。この場合、最初に一次転写されたトナ** リジナル原稿と異なってしまうという不具合が生じる。 は、中間転写体上に異なる色のトナーが重なった後、

【0038】本発明者らが検討した結果、用いる現像剤 の帯電量を現像順に高くすることにより、複数色の二次 転写時の転写特性が色によって一定化し、安定した色調 現像剤の帯電量の絶対値は10~30μc/gとするこ のカラー画像が得られることが明らかとなった。また、 とが転写特性を安定して得るために好ましい。

発明を詳細に説明する。

集度が5%未満の場合には、転写時のトナーのチリが発 生する場合があり、25%よりも大の場合には、転写時 [0039] さらに、本発明に用いるトナーには、本発 があり、擬集度は5~25%であることが好ましい。 疑 明の目的を違成するため、適切な流動性を付与する必要 に虫喰いが発生する場合がある。 [0040]トナーの擬集度の測定は、次のような方法 により行うことができる。すなわち、パウダーテスター (ホンカワミクロン社製)を用い、目開き75μm、4 5 μm及び22μmの篩をこの傾に上から並べ、目開き 7 5 μ mの篩に2 gのトナーを投入して、板幅1 m mで 定、それぞれに0. 5、0. 3及び0. 1の重みをか 30秒間振動を与え、振動後各篩上のトナー重量を測 け、加算して百分率で算出する。

た水酸基のうち上配反応により消失した水酸基の割合で て、疎水性のシリカが本発明の目的を違成するため効果 カ微粉末の表面をシラン系化合物で装面処理 (疎水化処 **興) することでコントロールできる。即ち、シリカ徴粉** 末に結合している水酸基にシラン化合物を反応させ、水 ある。疎水化処理はシリカ微粉末にジアルキルジハロゲ ルキルジシラザン、アルキルトリハロゲン化シラン毎を 的である。ここで疎水性のシリカとは通常疎水化度50 %以上のものを示す。シリカ微粉末の疎水化度は、シリ **かかきる。したがした、鞍水化敷とは鞣水化前に存在し** ン化シラン、トリアルキルハロゲン化シラン、ヘキサア **数基をシロキシル基等に置換することによりコントロー** 【0041】また、特にトナーに混合する菘加剤とし 萬温下で反応させることにより行なわれる。

ビュレットかちメタノールを加え、浮かんでいるシリカ [0042]また、前記シリカ微粉末の疎水化度は、次 のピーカーに水50mlを入れ、更に0.2gのシリカ 微粉末を添加する。そして、マグネットスターラーでゆ るやかに撹拌しつつ、滴下時に先端が木中に殺潰された の方法により測定することができる。即ち、200ml

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特阻平10-207164

9

微粉末が沈み始め、完全に沈んだ時の滴下メタノールの

陳水化度=(摘下メタノールのm1数/(50+摘下メ タノールのm 1数))×100 (%)

た、本発明に用いる疎水性シリカの含有量は、トナー粒 る。また、特に好ましくは0.3~1.5重量部程度で から求められる。メタノールはこの場合界面活性剤の役 **則をし、メタノールの商下に伴って砕いているシリカ徴** 粉末がメタノール各介して木中に分散するので、疎木化 度の値が大きいほどシリカ微粉末の疎水化度は高い。 ま **子100重量部に対し、0.1~2.0重量部添加され**

[0043] さらに、本発明者らが検討した結果、前述 現像されるトナーの単位面積当たりの付着量が少ない方 の概写時の虫喰いやトナーのチリといった現象に対し、 が有利であることが明らかとなった。

により前配の虫喰い現象が発生しやすくなる。したがっ いが、この場合に、画像濃度が不足し、高品位の画像が 【0044】 つまり、像担棒体から中間転写体、更には 悟写材へトナーは転移するが、トナーの付着由が多い場 同士の騒集が促進され、虫喰いが発生しやすくなり、更 ーを小粒径化することが好ましいが、小粒径化すること て、トナーの現像付着盘を更に少なくすることが好まし 【0045】また、一般的に高画質化のためには、トナ 合には転写時の押圧によりトナーの圧密によってトナ-に忠実なトナーの転移ができずにチリが発生しやすい。 得られなくなる。 ន

場合には、画像のザラツキ戲が目立つようになる。これ [0046] そのために、トナーの着色度は向上させる 必要がある。その一方で、トナーの付着量が少なすぎる らの点からトナーの着色度は、2.2~2.8とするこ とが好ましい。

|0047|| ここでトナーの着色度は、次のように測定 した。即ち、転写紙(リコ一製、タイプ6000、70 テール550の定**着装置に通過させ、定着画像をX**ーR i te社製の938スペクトロゲンシトメーターにて画 像濃度を測定した。また、本発明に用いるトナーの体徴 平均粒径は、4~9μmとすることが好ましい。9μm 解像力の高い画像が得られる。また、4μm未満の場合 W) にトナー1mg/cm²を付着させ、リコー製プリ 以下とすることで画像のザラツキ懸がなくなると共に、

即について詳細に説明する。本発明で用いるトナーにお 一用結婚機能として使用されてきたものが全て適用され る。具体的には、ポリスチレン、ポリヮークロロスチレ ン、ポリピニルトルエンなどのスチレン及びその置換体 の重合体;スチレン-p-クロロスチレン共重合体、ス [0048]以下、本発明に用いられるトナー及び現像 チワンープロピワン共気合体、メチワンーピニルトグロ **いて使用されるパインダー樹脂としては、従来からトナ** には、転写時の虫喰いが発生する場合がある。

8

特関 平10-207164

2 チルエーテル共竄合体、スチレンーピニルメチルケトン ル酸エチル共重合体、スチレンーアクリル酸ブチル共重 合体、スチレン-アクリル酸オクチル共重合体、スチレ ル酸エチル共園合体、スチレン-メタクリル酸プチル共 **11日本、スチレンーαークロルメタクリル酸メチル共重 - アニルメチルエーテル共組合体、スチレン-ピニルエ** レンーマレイン酸エステル共宜合体などのスチレン系共 ルブチラール、ポリアクリル酸樹脂、ロジン、変性ロジ ン、テルペン樹脂、フェノール樹脂、脂肪族又は脂漿族 パラフィンワックスなどが挙げられ、これらは、単独で 或いは2種以上混合して使用される。これらの中で、本 ン共重合体、スチレンーピニルナフタリン共重合体、ス チレンーアクリル酸メチル共宜合体、スチレンーアクリ ンーメタクリル酸メチル共宜合体、スチレンーメタクリ 合体、スチレン-アクリロニトリル共宜合体、スチレン 共宜合体、スチレンーブタジエン共宜合体、スチレンー インプレン共重合体、スチレン-アクリロニトリルーイ ンデン共宜合体、スチレンーャレイン酸共宜合体、スチ **齟合体:ポリメチルメタクリレート、ポリプチルメタク** リワート、ポリ塩化ピニル、ポリ酢酸ピニル、ポリエチ レン、ポリプロピレン、ポリエステル、ポリピニルブサ **段化水粟樹脂、芳香族系石油樹脂、塩栗化パラフィン、** 発明において特に好ましいのは、ポリオール樹脂、ポリ エステル及びエポキン樹脂である。

正極性のものとして、四級アンモニウム塩類、イミダン 【0049】本発明のトナーにおいては、トナーに適切 な帯電を付与するために帯電制御剤を含有させることが 一の色調をそこなうことのない透明色から白色系の物質 を添加し、負極性若しくは正極性にトナー帯電性を安定 好ましい。この場合の帯電制御剤としては、カラートナ 化付与することができるものが好ましい。具体的には、 **ール金属錯体や塩類等が用いられ、負極性のものとして** サリチル酸金属錯体や塩類、有機ホウ鞣塩類、カリック スアレン系化合物等が用いられる。

ダミン6G、レーキ、カルコオイルブルー、クロムイエ タ、シアン、ブラック色のトナーを得ることが可能な染 プラック、群骨、アニリンブルー、フタロシアニンブル ロー、キナクリドン、ベンジジンイエロー、ローズベン ガル、トリアリルメタン系染料、毎の染顔料など、従来 公知のいかなる染顱料をも単独或いは混合して使用し得 る。これらの着色剤の使用量は結着樹脂に対して、通常 【0050】また、着色剤としては、イエロー、マゼン 顔料が使用できる。例えば、カーボンブラック、ランプ ー、フタロシアニングリーン、ハンザイエローG、ロー | ~30塩曲%、好ましくは3~20重盘%である。

【0051】また、トナーに添加する外添剤として、本 発明において示される疎水性シリカの他に、流動性を向 上させる目的で疎水性の酸化チタンやアルミナ等を添加 することが可能である。なお、必要に応じて、脂肪酸金 **馬塩(ステアリン酸亜鉛、ステアリン酸アルミニウム**

粉、フェライト粉、ガラスピーズなどが、また、これら を芯材としてその要面にスチレンーアクリル酸エステル 【0052】また、トナーに帯電を付与し、現像ユニッ **戏分現像剤として使用することが可能である。キャリア** としては、粒径20~200 nm程度の鉄粉、ニッケル アクリル酸エステル重合体、メタクリル酸エステル重合 体、シリコーン樹脂、ポリアミド樹脂、アイオノマー樹 脂、ポリフェニレンサルファイド樹脂など敷いはこれら **共<u>重</u>合体、スチレン**ーメタクリル酸エステル共<u>重</u>合体、 トの中でトナーを搬送する目的でキャリアと混合し、 節)や、ポリフッ化ピニリデン毎を添加してもよい。 樹脂の混合物をコーティングしたものが使用される。 [0053]

ットはそれ自体公知であり、レーザダイオード、ポリゴ [発明の実施の形態] 以下、図4に基いて本発明の射画 像形成方法例及び装置例をさらに詳細に説明する。図4 の装置において、図示してないカラースキャナからのカ ラ一画像データを光信号に変換して、原稿画像に対応し た光書込みを行う図示してない書込み光学ユニットによ り、感光体(9)に静電潜像が形成される。 該光学ユニ ンミラー、ポリゴンモータ、結像レンズ、反射ミラー等 からなる。 感光体(9)は矢印のように反時計方向の回 ニングローラ及びクリーニングプレード (10-3) を 1)、帯電器(12)、電位センサ(13)、Bk現像 悟するが、その周りにはクリーニング前除電器、クニー 現像器(17)、現像濃度パターン検知器(18)、中 器(14)、C現像器(15)、M現像器(16)、Y 含むクリーニングユニット(10)、除電ランプ(1

削を膨光体(9)に対向させるように回転する現像スリ 間転写ベルト(19)などが配置されている。各現像器 (14)~ (17) は、静電潜像を現像するために現像 **康度検知センサなどで構成されている。ここでは、現像** Yとした例で以下に動作を説明する(但し、順序はこれ 覚枠するために回転する現像パドル及び現像剤のトナ-動作の順序(カラートナー形成順序)をBk、C、M、 **→ブ(14−1)~(17−1)と現像剤を扱み上げ**、 に限られるものではない)。 30

【0054】コピー動作が解しされると、図示してない カラースキャナで所定のタイミングからBk画像データ の競取りはスタートし、この画像データに基きレーザ光 による光書込み、潜像形成が始まる(以下、Bk階像と 昨する。C、M、Y についても同様とする)。このB k 4)の現像位置に潜像先端部が到達する前に現像スリー 替像の先端部から現像可能とすべく、B k 現像器(1

題域の現像動作を続けるが、B k 潜像後端部がB k 現像 (帯電量を最小に保持) で現像する。その後、Bk階像 位置を通過した時点で現像不作動状態にする。これは少 なくとも、次のC画像先端部が到達する前に完了させ ブ(14-1)を回転開始してBk潜像をBkトナー

鼠ねの一次転写画像を形成し、その後転写紙に一括転写 C、M、Yのトナー像を同一面に順次位置合せして4色 (二次転写)を行う。この中間転写ベルト (19)のユ [0055] 次いで、感光体(9)上に形成したBkト から中間転写ペルト(19)へのトナー像転写を「一次 転写」という)。一次転写は、戯光体(9)と中間転写 ペルト (19) とが接触した状態において、転写パイア ス亀圧を印加することにより行う。そして、中間転写べ ナー像を、感光体(9)と等速駆動されている中間転写 ペルト (19) の数固に精Þする (以下、敷光体 (9) ルト (19) には感光体 (9) に順次形成するBk、

1)を回転開始してC潜像を、帯電量を2番目に小さく **量を次に小さく保持したCトナーを使用したC工程に進** みでC階像形成を行う。C現像器(15)はその現像位 ナーを使用する他は、各々の画像データ銃取り、潜像形 [0056] 戯光体 (9) 側ではB k 工程の後に、帯電 むが、所定のタイミングからカラースキャナによるC画 像部取りが始まり、その画像データによるレーザ光書込 つ、C階像の先端が到達する前に現像スリーブ(15-保持したCトナーで現像する。その後C潜像領域の現像 を続けるが、潜像後端部が通過した時点で、先のBk現 像器の場合と同様に現像不動作状態にする。これもやは り次のM潜像先端部が到達する前に完了させる。M及び アの工程については、帯電量が順次大きく保持されたト 式、現像の動作が上述のBk、Cの工程と同様であるの 聞に対して、先のBk階像後端部が通過した後で、か

(22) は、約半分が観呈しているブラシローラ (22* [0057] 中間転写ペルト (19) は、転写パイアス (35) に架設されており、図示されてない駆動モータ ローラ (20)、駆動ローラ (21) 及び従動ローラ こより駆動制御される。ベルトクリーニングユニット

<プラックトナー>

帯電制御剤(含フッ聚四級アンモニウム塩化合物) 結婚樹脂 (ポリオール樹脂:軟化点105℃) 着色剤 (カーボンプラック)

を、プレンダーで充分混合した後、100~110℃に 放冷後カッターミルで粗粉砕し、ジェット気流を用いた 加敷した2本ロールにより溶融混練した。混練物を自然 し、母体着色粒子を得た。更に、本母体着色粒子100 0.8 負量部をヘンシェルミキサーにて混合を行ないト ナーを得た。また、本トナーを平均粒径50umのフェ ライト粒子にシリコーン樹脂を装面コートしたキャリア 微粉砕機で粉砕後、風力分級装置を用いて微粉を除去 **国量部に対して、様水化度60%の疎水性酸化チタン**

*-1)、ゴムブレード(22-2)棒などにより権成さ 中間転写ベルト(19)面から離反させておき、その後 れ、図示されてない接離機構により接離動作をする。こ の例では最終色の4色目)の一次転写が終了するまでは の接艦動作のタイミングはプリントスタートからY(こ の所定タイミングで、前記接艦機構によって中間転写く ルト (19) 面に接触させてクリーニングを行う。

ている。このパイアスローラ (23-1) は、通常は中 ルト (19) からの被艦破締 (23-3) 仰で権成され **【0058】紙転写コニット (23) は、紙転写パイア** スローラ(23-1)(二次転写用電界形成手段)、ロ 閲覧写ペルト(19)から艦反しているが、中間転写べ (転写材) (24) に一括転写する時にタイミングを取 **した被艦抜権(2.3-3)で芦圧され、村配ローラ(2 ーラクリーニングブレード(23-2)及び中間転写~** ルト (19) 面に形成された4色の重ね画像を転写紙 3-1) に所定のパイアス亀圧を印加して転写紙(2 4) への転写を行う。このように中間転写ベルト (1 2

ニット構成及び動作については後述する。

4) は、紙搬送ユニット (27) で、図示されてない定 れ、さらに除電ランプ (11) で均一に除電される。ま た、中間街時ペクト(19)のクリーコングは、前記の ハングかクリーニングロニット(2.2)を打配被臨機権 着器に搬送され、所定温度にコントロールされた定着ロ **ーラと加圧ローラでトナー像を融着定着されたフルカラ ーコピーを毎、一方、ペルト転写後の感光体(9)の安** ように、最終色のY画像のペルト転写終了後の所定タイ 9) 面から4色重ね画像が一括転写された転写紙(2 面はクリーニングユニット (10) でクリーニングさ **によった中国権婦ペグト(19)面に辞用して行う。** ន

[実施例] 以下、実施例により本発明をさらに詳細に説 [6900]

0.8 血量部 100年出記

の体積平均粒径は9.2μm、着色度は2.0、極塩度 は26であり、現像剤の帯電量は-16μc/gであっ り、以下の構成条件にてブラックトナーと回棲の条件で 100重量部に対し、5重量部の割合でターブラーミキ た。また、シアン、マゼンタ、イエロートナーについて サーにて混合し、現像剤とした。なお、得られたトナ 、ナーを作成し、同様に現像剤を作用した。 7 重盘部

6

[0900]

和白斑

(トナーチリ及び虫喰い) の評価を行ない、更にベタ部 好な結果を得た。なお、評価の方法は以下のとおりに実 得られたトナー及び現像剤をリコー製プリテール550 にセットし、ブラック、シアン、マゼンタ、イエローの 順に現像を行ない、4色重ね時の文字部における転写性 のザラツキ性及び画像濃度の評価を行なったところ、良 得られたトナー及び現像剤の特性を要りに示す。また、

外液扫描

ランク4 目視では確認できないが、ルーペで虫喰いが [0061] 転写時の虫喰いのランク ランク5 全く未発生 1~2箇所確認できる ランク3 目視ではほとんど確認できないが、ルーペで ランク1 文字の大半が抜けているのが目視で確認でき ランク2 目視で虫喰いが確認できる 虫喰いが数箇所確認できる

ランク4 目視では確認できないが、ルーペで僅かのチ 【0062】 転写時の転写チリのランク ランク5 全く未発生

リが確認できる

自視ではほとんど確認できないが、ルーペで チリが数箇所確認できる 5773

(0.7重量部) (0.7重量部) (0.7重量部) (0.7重量部)

(4.5重量的) Yellow 180)

(3.8重量部)

(7.2重量部) (2.0重量部)

(C. I. Pignent

(C.I.Pigment

C.I. Pigment

Red 122)

Blue 15)

ランク1 チリによる文字のボヤケが目視で確認できる ランク2 チリが目視で確認できる (シーペ: 命母10年)

[0063] ザラツキ柚ランク

ランク4 目視では均一であるが、ルーペで画像のムラ ランク5 均一なペタ画像

ランク3 目視ではほとんどザラツキが確認できない ランク2 目視で画像のザラッキが確認できる が、ルーペでは確認できる が僅かに確認できる

画像のザラツキがひどく、ベタ画像と言えな ランク1 イシムこ

マクベス反射機度計(マクベス社製)により単色の濃度 画像濃度 ೫

[0064] 実施例2 [0065]

質品質の評価結果を表7に配載する。 (1.2里量的) イエロートナー (C. I. Pigment サリチル酸誘導体用鉛塩 1-ボンブラック個フタロシアニンキナクリドン系倒料アン系翻料 [0066] 玻焰倒3 マゼンタトナー (1.0重量部) (1.0重量部) (1.0重量部) 100年出的 [0067] (C. I. Pigment [泰3] 帯電制御剤含フッ素四級アンモニウム塩化合物 は岩柏脂 ポリオール樹脂:軟化点110℃ ブラックトナー シアントナー ន C.I. Pigment た。なお、得られたトナー及び現像剤の特性、更に、固 を、実施例1と同様の条件でトナーを作成し、同一のキ ナリアと所定量混合して現像剤とした。得られたトナー 及び現像剤を用いて、実施例1と同様の評価を行なっ 着色期

質品質の評価結果を扱りに記載する。 [0068] 実施例4 [6900] [泰4] \$ **ャリアと所定量混合して現像剤とした。得られたトナー** た。なお、得られたトナー及び現像剤の特性、更に、画 を、実施例1と同様の条件でトナーを作成し、同一のキ 及び現像剤を用いて、実施例1と同様の評価を行なっ

(6. (重量的)

(6.0重量部)

(9.0重量部) (3.5重量部)

政大柱シリカ (球水化度80%)

不裕相差

Yellow 180)

Red 122)

Blue 15)

(0.7里角部)

(0.5重量部) (0.6页量部) (0.7页量部)

<u>6</u>

マゼンタトナー イエロートナー

シアントナー

ブラックトナー

100 粗量部

ポリエステル樹脂:軟化点110℃

的推婚

サリチル酸熱導体亜鉛塩

(1. 0里量節)

カーボンブラック個フタロシアニンキナクリドン系類粒アン系類型

都色生

(1.0里量部) | (1.0蛋量部) | (1.0蛋量制)

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61				20
	ブラックトナー	シアントナー	マゼンタトナー	イエロートナー
枯茗樹脂	ポリエステル価脂:軟化点98℃	: 軟化点98℃	100重量部	4
非電影響	含フッ素四級アン	モニウム塩/サリ	帯電部御倉含フッ素四級アンモニウム塩/サリチル酸誘導体亜鉛塩	
	(1.0/0.5重量都)	(0.8/0.7重量都)	(1.0/0.5宜量的) (0.8/0.7宜量的) (0.6/0.8重量部) (0.4/0.9宜量部)	(0.4/0.9宜量部)
港 色剤	カーボンブラック	飽フタロシアニン	カーボンブラック網フタロシアニンキナクリドン系質料アン系質料	アン系数料
		711-		
		(C. I. Pigment	(C. I.Pigment	(C.I.Pignent
		Blue 15)	Red 122)	Yellow 180)
	(9.0重量部)	(3.5重量部)	(6.0重量部)	(5.8重量部)
外添加剂	疎水性シリカ (疎水化度80%)	水化度80%)		
	(0.6重量部)	(0. 6 <u>11量</u> 部) (0. 6 <u>11量</u> 部) (0. 7 <u>11量</u> 部)		(0.7重量部)

*質品質の評価結果を要7に記載する。 [0070] 比較例1 [0071] 2 を、実施例1と同様の条件でトナーを作成し、同一のキ **ャリアと所定量混合して現像剤とした。得られたトナー** 及び現像剤を用いて、実施例1と同様の評価を行なっ

た。なお、得られたトナー及び現像剤の特性、更に、画*

(1.2里最高) (0.8里最高) (0.8重量部) (0.8宜量部) (0.7里角形) (0.7里角形) (0.7里角形) (0.7里角形) (6.2重量部) Yellow 180) マゼンタトナー イエロートナー カーボンブラック倒フタロシアニンキナクリドン系館料アン系質料 ポリオール相隔: 軟化点105℃ 100重量部 (9.0重量部) (3.5重量部) (6.0重量部) (C. I. Pigment Red 122) 疎水性酸化チタン (球水化度20%) **帯電制御剤含フッ素四級アンモニウム塩化合物** ブラックトナー シアントナー C.I.Pigment Blue 15) 結者機脂 全被打磨 岩色期

質品質の評価結果を扱りに配載する。 [0072] 比較例2 [0073] 6 ャリアと所定量混合して現像剤とした。得られたトナー 及び現像剤を用いて、実施例1と同様の評価を行なっ た。なお、得られたトナー及び現像剤の特性、更に、画 を、実施例1と同様の条件でトナーを作成し、同一のキ

(1.0里量部) (1.0里量部) (1.0蛋量部) (1.C蛋量部) (9. 0.重量的) (0.8重量部) (0.8重量部) (0.8重量部) (0.8重量部) マゼンタトナー イエロートナー Yellow 180) (C. I. Pignent カーボンブラック調フタロシアニンキナクリドン系質料アン系質料 100年年 (9.0重量部) (C. I. Pigment Red 122) **吉着柑脂 ポリエステル樹脂:軟化点105℃** 帯電制御剤含フッ素四級アンモニウム塩化合物 (5.0重量部) **ブラックトナー** シアントナー **本添加剤 球水性シリカ (球水化度30%)** (C.I.Pigment Blue 15) (12重量部) 潜色期

質品質の評価結果を按7に記載する。 [0074] を、実施例1と同様の条件でトナーを作成し、同一のキ **ャリアと所定量混合して現像剤とした。得られたトナー**

[来7] 8 及び現像剤を用いて、実施例1と同様の評価を行なっ

た。なお、得られたトナー及び現像剤の特性、更に、画

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[作号の説明] w 虫喰い 11 電極

15-1 現像スリーブ

23

		果前重	ALETO!	24	陈确更	時動展				₩₩·3	4 0-4	1-64	-			
タ 製			(學代刊)	6 6 30 \$12.30	WB#		TWO.	36.64K	平衡本	基加效	HEATERSHIP	量成類	神味者 既	和读事法		
WB4	(合和)	14464 14464	4×2	416	(2/2n-)	(% 3 ×)				(番魚魚)		(耐量量)			1 10/25/16	
_	7.1	_	. '		91	6.0		9.2	Z *6	6.0	- サ木和	8.0	見様で含	4-16.4		1 日報
0	6 T	9					72 82		9.2	8.0 8.0	ALCO NO.	0.1	(Y) \$146-144		4/24	
	0.5				TZ ST					8,0		2,1				
	8-1				54		18	1.2		7.0	去水柜	0.1	华西金1114	46Y=1,#	6667	S M SK
0	5 1	979	9*	97		67	91	8'1	2 6	7.0	464		(8) 政(発重本)	斑斓	1.11	
	8.1							1.8	9.6	7.0		1.0			6/34	
	2.2							₹7 61		2 O	對大概		母を代合	4-11.4	446X	5 時期
•	2.2	9	9		EX	[9				9.0	16/4		(A) はよたから	部簿		
	2.3				77	0.0	81	2.4	6.8	10		0.1	数据像444		4/AA	•
	2.2				872			97		20			(8) 京田東東	-VEC-19 ,4	-017	· · · · · ·
0	2.2	9	2	9	22 02	2.1 2.0		7 7 7 7		90		7.0/8.0	(8)/(V)	銀体	6662	7 M T
_	2.2	!							29	7.0		B.0\alpha.0	(~, (~,	correct.	4/3-	l
	2.2								p 9	7.0		8.0/1.0			- E	
	2.2				0Z		EE	23	Z 9	Z '0	おみを	Z T	海7米/L 尼	4-16.*		1 10 AK
×	6.4	ا ہ ا	z			<u> </u>	1 1			1.0	44700種		(な) ませんりかべて	斑眸	7.17.	
	2.5								69	7.0		8.0			41.70	l
	5°2					2.0				8.0	對水鄉	8.0	報行手・仁中	aeki (, #	-027	C 150-000
	2.4	8	,	•		0.3		1.5		8.0	16/3		砂味べき (A) 主人(こうくて		7.L/s 4662	2 PQ-500
	A.S. 4							2.0	₱ °6	8.0		0.1			41.77	
	3.5				24	9.0	36	3,1	9.6	8.0		1.0			ーロエン	

らに、トナーの着色度を2.2~2.8とし、体積平均 50 図である。 に、本発明は、中間転写方式を用いた画像形成方法にお いて、少なくともブラック、シアン、マゼンタ、イエロ u c / gとすることで良好な転写特性が得られ、虫喰い は少なくとも疎水性シリカを含有し、凝集度を5~2.5 一色からなるトナーを、像担特体上に現像する順に現像 剤の帯電量が高くし、且つ帯電量の絶対値を10~30 %とすることで、更に良好な転写特性が得られ、またさ や、転写チリといった現像を防止でき、さらに、トナー [発明の効果] 以上、詳細かつ具体的に説明したよう

40 粒径を4~9μmとすることで、さらに良好な転写特性 が得られるという極めて優れた効果を発揮する。

[0075]

[図面の簡単な説明]

[図1] 従来の画像形成方法において発生する虫喰い状 の画像例を示す図である。 [図2] 従来の画像形成方法における高い要面租度と虫 喰い状の画像発生を説明する図である。

【図3】従来の画像形成方法における虫喰い状の画像発 生因を説明する図である。

【図4】本発明の画像形成装置例及び方法例を説明する

[🖾 2]

ローラクリーニングブレード

接離機構 配可紙

23 - 3

23 - 2

被派へアト 谷町ローア

現像スリーブ

14 - 1

C現像器 [⊠1]

Bk現像器 配位センキ

煮物 ロンスト スローア

紙転写ユニット

ゴムブレード

プラシローラ

2.2 - 1

殿光体クリーニングユニット クリーニング前後電器

プラシローラ ゴムプレード

10 - 110 - 210 - 3

10

除電ランプ

帯電器

概光体 (像担持体)

GD エアギャップ

II-2 電極凹部 11-1 電極凸部

ベルトクリーニングユニット

現像濃度パターン検知器

現像スリーブ

17 - 1

現像スリーブ

16 - 1

M現像器 Y現像器

気与パイアスローラ 中間幣呼んグト

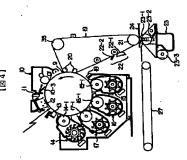
6 20 2 2 2

財製ローア

·		ઉ	国部被	
	3]	(0)	四郡被徵 1	
,	[83]	(P)	白色被包	
		(a)	中回按数	

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フロントページの続き

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